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Electrical World

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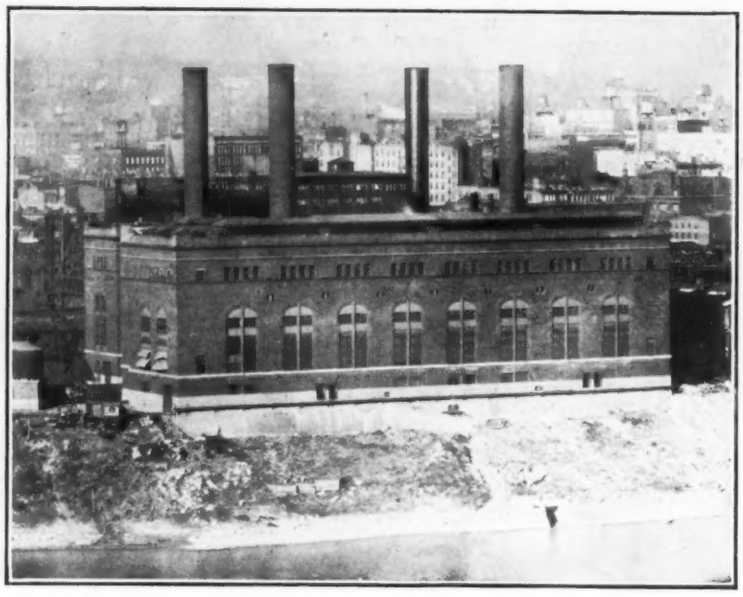
Ice Making with Electric Power

Loading Transformers on a Temperature Basis, *by N. L. Dolph*

An Experiment in Co-operation, *by C. L. Eidlitz*

Interpretation of a Decision on Co-ordination, *by W. J. Canada*

Possible Economies in Energy Production—A. S. M. E. Convention



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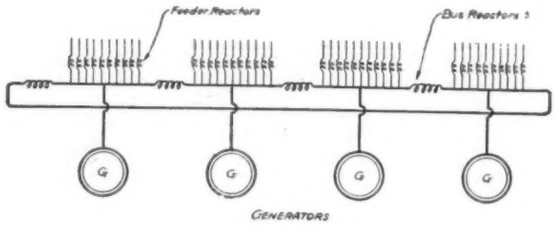

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Electrical World

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W. H. ONKEN, JR. Editor — HAROLD V. BOZELL Editor

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For the Company or for the Department?

WHO is it that the employee of the central station is working for — his company or the department to which he happens to be assigned? This apparently innocent, rhetorical-looking question involves an important consideration. For to some individuals in every large organization and in many small ones the purpose or the viewpoint of a department often outweighs, and sometimes actually conflicts with, interests and objectives which are absolutely vital to the company.

The case of the meter reader and the collector will illustrate the point. These are two men who are continually in contact with most of the people of the community. To many householders they are the light and power company. They make or break its reputation. Day after day, they help or hinder the company in its efforts to improve public relations and to promote the idea to "do it electrically."

IT SEEMS reasonable that one of the primary qualifications in a meter reader or a collector should be a proper attitude toward the development of good customer relations and a proper interest in the ambitions of the sales department. To insure this and to simplify the work of guiding and inspiring these men properly some of the most progressive and successful companies believe that the sales department should have control of them. In most companies, however, the logic of this reasoning does not prevail. Because the actual work of these men consists of recording the readings of meters and collecting bills, they are for reasons of internal expediency linked with the bookkeepers under the control of the auditor. Straightway, speed and accuracy become the chief aims, and a most important opportunity before these men becomes the secondary consideration. It is inevitable that it should be so.

IT HAS long been a problem how best to capitalize on the possibilities of the customer contacts of these men. No employee should lack information and schooling as to the real purpose of his work and as to who it is he is really working for. There is always the necessity of getting the work done and done properly. But it is also important that the work of the various groups be so organized and co-ordinated that the direction of meter readers, collectors and any other group of central-station employees with public contacts shall be in the hands of officials who are disposed to insure that these men will work to further the true ideals and purposes of the company. No office expediency or departmental jealousies should be allowed to interfere, as is too often the case.

Guy Webster Talbot

A public utility executive who has a genius for organizing power and railway properties.

REMARKABLE ability to judge character and pick men who can take responsibility and the ability to organize, coupled with democratic and human qualities which have enabled him to develop the utmost loyalty among those in his organization, are the attributes which made Guy Webster Talbot, now president of the Pacific Power & Light Company, a utility executive at the age of twenty-nine.

He has a keen, analytical mind and is able to grasp the broader features of any situation quickly. His ability to meet and judge men of all types, his faculty of delegating responsibility to those under him and his knowledge of finance and business management have enabled him to build up a most efficient organization. Mr. Talbot was born in Centerville, Mich., Aug. 12, 1873. He obtained his public school education in Des Moines and later pursued a college course at Emporia, Kan. His first employment was with railroad companies. Beginning as a ticket agent, he advanced until in 1901 he became traffic manager of the Peoria & Pekin Terminal Railway Company, going on to the general superintendency and eventually being made vice-president and general manager.

In 1906 Mr. Talbot removed to Portland, Ore., where he became identified with the Astoria & Columbia River Railroad Company as vice-president and general manager. He held a similar position with the Corvallis & Eastern Railroad and in 1907 was made vice-president and general manager of the Oregon Electric Railway Company. In 1910 he was elected to the presidency of the Pacific Power & Light Company and the Portland Gas & Coke Company, both with headquarters in Portland.

Mr. Talbot has taken a very active part in civic affairs and during the war was in direct charge of all Liberty Loan drives in Portland. He has been an active worker in the National Electric Light Association, having served as president of a geographic division, the Northwest Electric Light and Power Association, during the association year 1917-1918.

Mr. Talbot has been a member of the water-power committee of the N. E. L. A. for a number of years, and in that capacity he spent much time and energy in helping to persuade the Federal Power Commission to adopt workable rules and regulations under the water-power act.

Editorial Comment

Electrical World, December 15, 1923

Volume 82 Number 24

Why Not Voting by Electricity?

MANY a man with an hour or two to spare in Washington goes to the Capitol and enters one of the House galleries, hoping it may be his good fortune to hear a new "Sunset" Cox as he soars in the oratorical empyrean, to see a present-day Blaine and Conkling clash in an argumentative joust, or at least to catch the House convulsed with laughter as some bewildered member inquires: "Mr. Speaker, where was I at?" The visitor is a hundred times more likely to hear the clerk droning, "Mr. Brown of Maine, Mr. Brown of Texas," and so on down the list. By the time the clerk reaches "Mr. Smith of Wyoming" on the third successive roll call the bored citizen in the gallery is apt to beat a retreat, resolved to spend in some other fashion the rest of the time till his train is ready.

For many years a bill has been introduced into every Congress providing for the substitution of electro-mechanical for *viva voce* voting. For some reason not apparent, unless it is the objection of chronic filibusters to have their favorite indoor sport interfered with, this bill has never become law, and what is in the aggregate a tremendous waste of the legislators'—and therefore the people's—time continues. Surely so simple an application of the electrical art could be adopted without unduly enriching any patentee or contractor or arousing a suspicion of wrongdoing on anybody's part. It would be in line with the practical character of which Americans are proud and with a hundred other applications in public buildings of every sort. Of what are our Congressmen afraid?

Residence Survey Plan Has Three Purposes

WITHIN the last year or two a number of central stations about the country have made separate surveys of their residence load. They have found that three things can be accomplished by such a house-to-house canvass of the community. An accurate knowledge can be obtained of the number and kinds of lamps and appliances in use in the homes on which to base future merchandising efforts. This is valuable. First and foremost, however, such a canvass brings an opportunity to carry to every customer, every householder, in a personal way an evidence of interest and good will and an interpretation of the service of the modern light and power utility and its place in the community. This is of tremendous benefit to public relations. Then, thirdly, it has been found that new interest has been automatically created in the use of electricity in the home which has influenced the sale of many additional appliances. In short, such a survey will finance itself, even though merchandising may be considered quite a secondary purpose in the enterprise.

It is well to have these three points clearly in mind in considering the plans now being developed by the National Electric Light Association for a national residence survey, for there has been considerable misunderstanding. It has been believed by some that the N. E. L. A. intends to call upon member companies to hire men and make an expensive survey of their entire territories within a year, with the prospect of developing a lot of interesting information but little more. This is not the case at all. In small cities a year would undoubtedly suffice to visit all present customers, but in larger communities it may be far more practical to make it a two-year undertaking, and on such a basis the cost of the survey need be an obstacle to no one. In one city already surveyed it is said to have cost 25 cents a call to make the canvass—and what company will not gladly invest 12½ cents per consumer per year in such an enterprise? Even if it cost twice that amount, it would be good business.

The electrical industry is now operating in almost total ignorance of the exact condition of its market in so far as the household is concerned. The information that such a national residence survey will bring will be of inestimable value. The benefits to public relations which will accrue from a systematic, personal, friendly, helpful contact with every consumer of electricity will also be past all calculation.

Why Not Advertise Our Accomplishments?

IT IS true, as an old playwright said, that "on their own merits modest men are dumb"; but modesty, however it may appeal to the cultured, is a handicap to any public utility in this day and generation. It is necessary to step "o'er the bounds of modesty" if the meritorious utility is to get the credit that is its due. And why not? Men show their dogs and horses if they possess merit and expect them to win blue ribbons. A manufacturer makes something worth while or better than his competitor and immediately advertises it. Should not electric public utilities do likewise? If a municipality takes over an electric system and, profiting by advances made in the art, toward which, by the way, it has contributed nothing, rehabilitates the system and reduces rates, the municipal authorities always make sure to inform the public of the hundreds of thousands of dollars the municipality has saved its citizens. It has done something worth while and has a right to be proud of it.

The difference between a municipally owned and the ordinary electric service company, however, is that the latter is continually making improvements which benefit the public, but rarely says much about it, knowing that a public utility is obligated to render the best service at the lowest possible rates. To possess such a sense of duty is noble, but the consciousness of doing well does not suffice in the public utility business. People must know of it. When municipalities tell of the immense savings they have made to users of electricity, the impression left is that the ordinary electric

service company has but one ambition and that is to keep rates up.

This is not so. Our electric public utilities are constantly striving to give improved service at the same or lower rates, and that is why they enjoy such popularity. The Brooklyn Edison Company, for example, has just purchased the electric property and franchise of the Flatbush Gas Company. Edison rates become automatically applicable in Flatbush, and 35,000 users there on the basis of present consumption save $250,000 a year. This is but one case, yet it is typical of the service which our electric public utilities are constantly rendering. It is certainly worth while doing and worth while advertising also.

The Passing of an Empire Builder

NOT to many in this country was Sir William Mackenzie known. His name, however, was for years a household word in Canada, his native land and the legatee of much of his work. The people of the maple-leaf country owed much to him and were in turn not unkind to the "Emperor of the North." Sir William's accomplishments were many and varied. He it was who laid the foundation of the electrical industry in Canada, who gave Toronto and Winnipeg their electric railway and lighting systems, helped harness Niagara, and whose electrical activities extended into Mexico and far-away Brazil. Mackenzie was of the pioneer, master-builder type, not unlike the late James J. Hill of this country, who himself, by the way, was born in Canada.

Sir William Mackenzie was quick to grasp the opportunities which a budding country like Canada offered and did much to build up the provinces. To transportation he devoted a great part of his life, and while he aided in the building of the Canadian Pacific, his crowning achievement was the Canadian Northern Railway, extending from coast to coast and undertaken after he had passed the prime of life. His interest in lumbering and mining was also large. It is given to few men to serve their country as greatly and as acceptably as Sir William Mackenzie served his, and we join with Canada in lamenting his loss and paying tribute to those qualities which made him a leader among men.

Personal Service and Public Relations

THE employees' service guide of the Illinois Power & Light Corporation, printed on page 1230 of this issue, embodies two basic principles essential to building good public relations. First, responsibility for customers' satisfaction is placed directly upon the personal service of the individual employee. Second, the employee's duties are clearly and definitely stated in a few brief instructions which constitute the guide. Thus he knows what is expected of him and has the added incentive to produce results through his own initiative. This is in contrast with some public relations efforts which have emphasized the quality of a company's service in terms of its continuity, close voltage regulation or the vastness of its power system, all valuable, but apparently overlooking the most important side—the human element—upon which the whole structure is dependent. Customers and employees alike are human beings, and, after all, in a business transaction it is personal service that counts most. For this reason alone the service guide of the Illinois Power & Light Corporation merits careful study by central-station men.

Overemphasizing Unit Costs in Plant Design

HASTY generalizations drawn from inadequate analyses of plant construction costs, whether estimated or historic, should be avoided by designing engineers and utility executives as the dissemination of such data becomes more common. There is a wholesome tendency at present toward increased thoroughness in the preparation of cost figures for use by regulative commissions, bankers, investors and operating men, especially in generating plant, substation and transmission-line developments. The filing of such information with utility commissions automatically throws it open to public scrutiny. Much of it finds its way into print and is of value to engineers, but a word of caution is not amiss in regard to unit interpretations.

Unit figures of final costs in plants or on systems completed according to scheduled development are naturally of prime value if dates of work done, localities and names are available. Obviously the reputation of the engineers responsible for such development establishes the value of cost information. Some estimates of anticipated cost by engineering concerns of high repute are worth more to the profession than are other indifferently kept records of cost in the field. Even if the locality and name of the job are omitted, there are many estimates and historical cost records of great potential value to the engineer prepared in practice from time to time, provided these give enough detail as to the project to permit rough comparisons to be made. Misinterpretation of unit figures, however, needs to be particularly avoided in plants for which estimates or outlays cover only a part of the completed scheme, and simple as this may appear from the arithmetical standpoint, it deserves consideration because not a few people lose sight of the influence of partial development upon earlier costs.

The cost per kilowatt of a new plant with a building large enough to house several generating units but covering one initial machine and a fraction of the ultimate boiler capacity becomes very misleading unless it is clearly understood that the figure applies to a partial development only. The growing use of electrically driven auxiliaries tends to put demands upon prime movers which amount to a decided increase in useful rating; but if this rating is not expressed in the divisor into a total cost figure for a given stage of plant development, inaccuracy may result in comparing the unit cost with that of a station using chiefly steam-driven auxiliaries. Usually the investment in crane equipment is completed at the start except for extending runways as the building grows, and often the feed pump installation, stack investment, boiler equipment and no small share of the fuel-handling facilities cover the requirements of more than one generating unit. The unit cost of the plant tends to diminish as it proceeds.

Clearly, the extent of plant development should always be kept in sight in studying both total and unit cost data, and in general the more symmetrical the development with relation to a well-rounded scheme of design and construction, the more valuable will be the unit figures. Total costs for different steps in piecemeal development are always useful if sufficiently de-

tailed to enable the work to be visualized from the engineering standpoint, but reasonable care should be employed in reducing such costs to unit bases.

New Steam Cycles Offer Possibilities for Economy

THE possibility of producing a kilowatt-hour for 12,000 B.t.u. certainly seemed visionary two years ago. But when outstanding engineers say that such an accomplishment is now reasonably possible on a commercial basis, operating executives should study these prospective super-economies in connection with developing the capacity of their systems to carry the growing loads.

At the power session at the A. S. M. E. convention several notable papers were presented dealing with possible economies in energy production from fuel, and in the brief abstracts presented in this issue the authors of the papers have given definite answers to many questions which have long been speculative. Air heaters both at Pittsburgh and Kansas City have proved economical and efficient for certain fuels and conditions. Tests have answered all questions as to their value in specific installations, and their place is established in central-station practice.

But of far more potential value to the industry are the reasoned statements of such authorities as Professors Hirshfeld, Wohlenberg and Ellenwood to the effect that the adoption of certain steam cycles, pressures and temperatures is both economical and practicable and will result in enormous gains in the thermal performance of power stations. Actual data are lacking to support their conclusions, but their careful studies and analyses can be taken as the approximate answers to many heretofore speculative questions. And it is rather unimportant that they disagree as to the particular cycle which is best to use, since either the bleeding cycle or combination bleeding and reheating cycle results in expected performances much superior to those now obtained. Even the question as to the relative advisability of using 800 lb. or 1,000 lb. pressure is unimportant, since either pressure gives worth-while results when used with the proposed cycles.

From the cost standpoint, with due consideration of the price of fuel, stations incorporating the high thermal efficiencies are commercially feasible and should be profitable. As pointed out by V. E. Alden, studies made on a basis of output per unit of capacity may even show high-pressure stations to be cheaper than low-pressure plants.

But the authors of the papers warn their readers that it is unsafe to generalize from their analyses, that many of the data are extrapolated, that many items of equipment remain to be developed commercially, and that local conditions such as load factor and fuel costs are decisive elements in designing a given station. In their opinion no great obstacles from a thermodynamic or mechanical standpoint stand in the way of actual accomplishment, but predicted results must be corroborated by actual data before generalizations are made. They have defined the limits in pressure, temperature and costs broadly and, like the rest of those interested, await the completion of plants now building for proof of their predictions. They are to be congratulated on the excellence of their studies and on the clearness and conservatism with which they outlined the theoretical and practical limitations involved in the applications of their conclusions.

Economical Loading of Distribution Transformers

LOADING distribution transformers on a temperature basis as a means of more economical operation is receiving the serious consideration of central-station companies as well as of manufacturers. The interests of these two groups relating to this particular problem are in some ways opposed, although, of course, in a broad way they are identical. The interest of the central station is to secure the maximum possible output from the transformer without loss of an unreasonable number of units by overload. The interest of the transformer manufacturer is to have the operating conditions such as not to shorten the normal life of transformers.

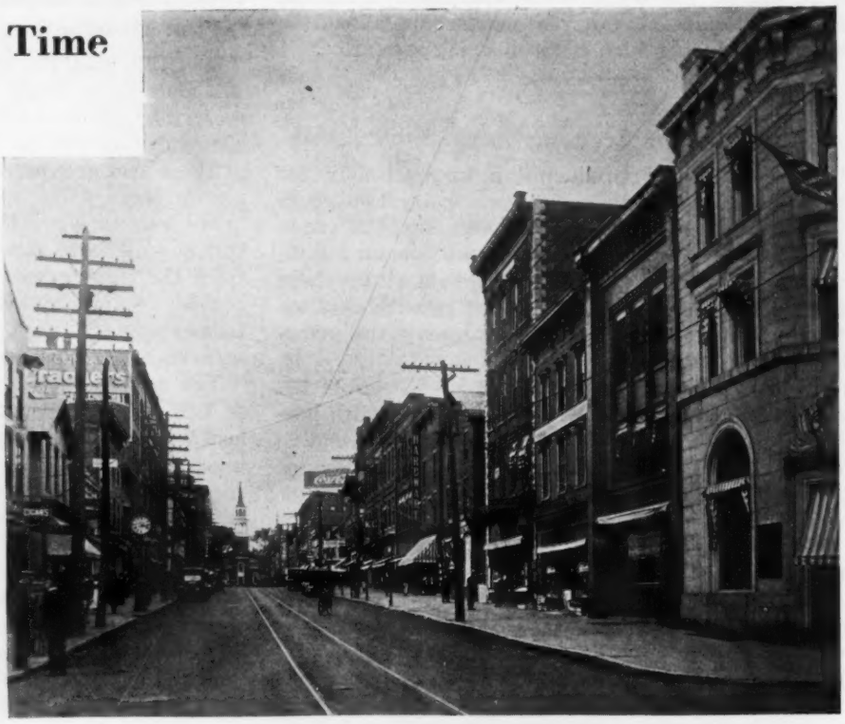
The output rating of transformers as given in the A. I. E. E. standardization rules is based on a maximum load without exceeding a given temperature in the windings. This, of course, does not mean that the transformer cannot operate for short periods at an overload or at temperatures slightly above those specified for continuous operation. It is generally understood that the deterioration of transformer insulation depends not only on the actual temperature attained but on the length of time the condition is maintained. In other words, short periods at a slightly higher temperature than 105 deg. C. may safely exist if they are balanced by periods at which the transformers are operating below these values.

While loading on a temperature basis is undoubtedly the proper condition, the peak overload should not be carried too far. Reference is made in the article by N. L. Dolph in this issue to certain cases where peak loads as high as 200 per cent may be practicable, and it is maintained that ordinary conditions justify a value of 165 per cent on lighting feeders. It is pointed out that the feeder regulator will take care of the voltage regulation under such extreme overload conditions. While this is true in general, yet it is a fact that a circuit controlled by a particular regulator usually carries transformers of different ratings whose normal regulation may differ greatly. Therefore, if the feeder regulator is set to take care of the regulation of a particular transformer under the high overload, it may give voltages too high or too low for another unit of different characteristics in a different location.

It is obvious that the application of distribution transformers on a temperature basis should be controlled by a visual temperature indicator and that the keynote of such a device must be reliability and simplicity. As pointed out, such a device need not be complicated by attachments which attempt to control the possible loading which may be carried due to seasonable changes in the air temperature. In the winter the loads are heavier and the air temperature lower, while in summer, although the ambient temperature is higher, the loads are less. In this way the two conditions approach something like a balance.

In general the application of transformers on a temperature basis should be controlled by the same spirit of conservatism and common sense which any engineering problem requires. The gain which can be accomplished by a conservative application of the principle is so large that trying to gain the last volt-ampere capacity of the transformer is not justified by the additional effort and risk required. Studies such as those of Mr. Dolph are very valuable in showing the governing elements in distribution transformer loading and should be used to advantage.

Street Cleaning Time Is Here



MANY streets appear as indicated in the upper right hand photograph until some wideawake central station executive or salesman calls attention to the fact that street cleaning is a valuable annual civic asset which should be applied to all civic institutions which are behind the times. The central view shows how underground construction and the use of modern trolley and light standards can be made to produce a distinctly better appearance in a street, and lighting at night as shown below means that shopping hours will be extended and downtown trade in general will be improved. Nothing modernizes a city more than the use of underground construction and up-to-date street-lighting and street railway equipment.

Loading Transformers on Heat Basis

Economic Study of Transformer Operation Shows Possibility of Great Savings if Lighting Transformers Are Operated on a Temperature Rating Basis—Other Load Limitations Discussed

By N. L. DOLPH
Transmission and Distribution Department, Philadelphia Electric Company

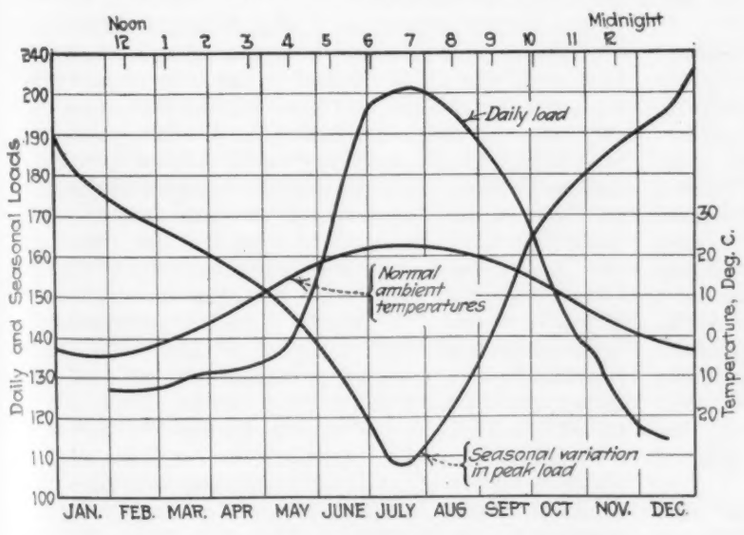
NEARLY every central-station company has a considerable number of transformers in service, ranging in size from 1 kva. to 50 kva., that are never called upon to carry peak loads equal to their continuous load ratings. In such installations the possible economies that might result from well-planned replacements or rearrangements of transformers are obvious. This, however, is only applicable to a relatively small percentage of the transformers on a system. But by taking advantage of the fact that residential lighting loads are at a maximum for only a few hours each day it is possible to utilize the overload capacity of transformers, thereby introducing economies that may be applied to nearly every transformer carrying such loads.

Modern distribution transformers are designed to comply with the Electric Power Club standards specifying a maximum temperature rise of 55 deg. C. Ratings are based on a rise of 55 deg. C., above an ambient temperature of 40 deg. C., under continuous load. The actual limit to the load a transformer may carry is, however, fixed by the coil temperature, which should not exceed 105 deg. C., as specified by the A. I. E. E. standardization rules for Class A-2 insulation. Temperatures higher than this may cause damage to the insulation, although exigencies arising from operating conditions sometimes result in temperatures slightly higher than 105 deg. C., apparently without serious deterioration.

Applying this principle to a specific case, the normal ambient temperature curve of Fig. 1 reaches a maximum of 23 deg. C. (73.4 deg. F.) during the summer months. On unusually warm days, however, ambient temperatures as high as 35 deg. C. (95 deg. F.) may be encountered at the time of day when lighting loads are maximum. The seasonal load curve shows that at the time of year when such temperatures occur the daily peak loads carried are at a minimum. During December and January, when the greatest demand is made on lighting transformers, the ambient temperature is normally less than 0 deg. C. (32 deg. F.), which leaves a margin of 40 deg. C. in permissible temperature rise if the transformer is considered as carrying rated load. Many transformers are liberal in design and do not have as great a temperature rise as 55 deg. C. As the ratings are based on continuous loads, it is evident that because of the comparatively short duration of the lighting peak there is an unnecessarily large margin of safety in overload capacity.

Considered in this light, it is not surprising that some transformers might safely carry loads as high as 200 per cent rating under favorable service conditions. Observations of coil temperatures have been made on transformers under various loads, both characteristic and continuous, and at ambient temperatures varying from — 5 deg. C. (23 deg. F.) to 40 deg. C. (104 deg. F.). The results obtained indicate that at the ambient temperatures ordinarily encountered it is practicable to carry consistently peak lighting loads as high as 165 per cent.

A study of the daily and seasonal load curves of circuit feeders supplying only residential and commercial lighting loads shows that the load varies through a well-defined cycle having a period of twenty-four hours (Fig. 1) and that the maximum load is carried for approximately two and one-half hours



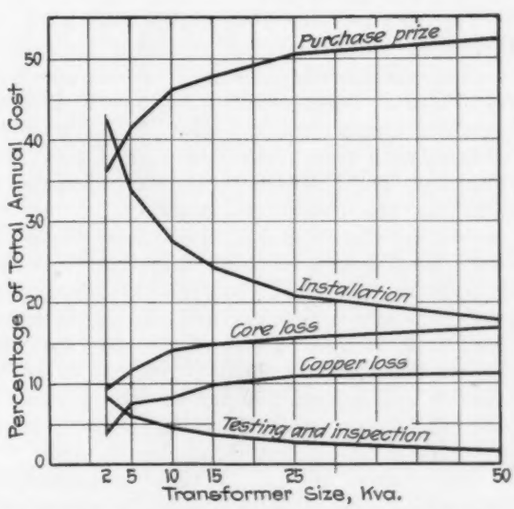


FIG. 1 (LEFT)—TRANSFORMER OPERATING CONDITIONS AND EFFECT ON TEMPERATURE RISE. FIG. 2 (RIGHT)—TRANSFORMATION COSTS FOR RESIDENCE LIGHTING LOADS EXPRESSED IN PER CENT OF THE TOTAL ANNUAL CHARGES AGAINST TRANSFORMER INSTALLATIONS WHEN THE PEAK LOAD EQUALS THE TRANSFORMER RATINGS

in twenty-four. The shape of this daily load curve is similar throughout the year, but the peak load is considerably greater during the winter months, as indicated by the seasonal peak-load curve, which indicates a growth of load of approximately 8 per cent during the year.

The distribution transformer receives energy from the primary lines and delivers energy to the secondary system. The most economical operating condition prevails when the total transformation cost per unit of energy delivered to the secondary is least. The attainment of this condition, however, may be subject to practical limitations to be considered later. The costs chargeable to a transformer installation include interest, depreciation and taxes on the total cost installed, energy losses, inspection and testing. Overhead charges may be included as a part of each of these items. Fig. 2 shows graphically the relative importance of these items for transformer installations ranging in size from 2 kva. to 50 kva.

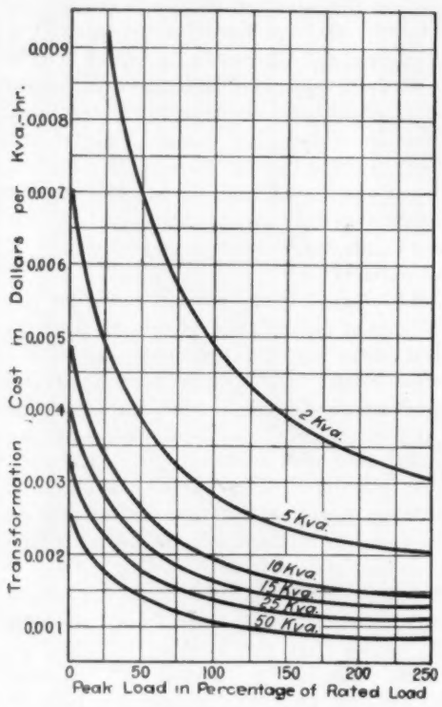
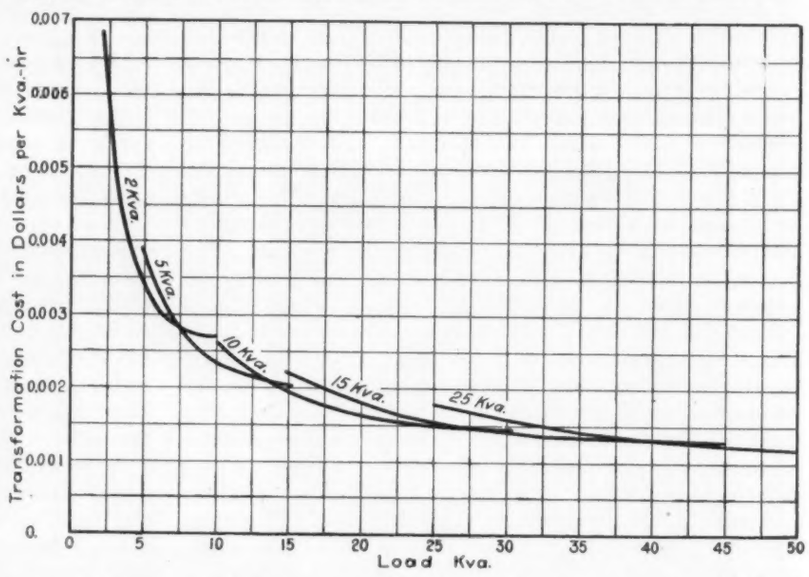


FIG. 3—TRANSFORMATION COSTS PER UNIT OF ENERGY CHARGEABLE TO EACH SIZE OF TRANSFORMER UNDER ASSUMED CHARACTERISTIC LOADS

(Equivalent hours, 2.27; load factor, 20 per cent; core loss energy, $0.01 per kilowatt-hour; copper-loss energy, $0.023 per kilowatt-hour.)

FIG. 4—MOST ECONOMICAL TRANSFORMER RATINGS FOR LOADS UP TO 50 KVA.



The problem of determining the most economical operating condition may be solved by calculating the transformation cost per unit of energy chargeable to each size of transformer when operated under various assumed characteristic loads. A curve of such costs, plotted with transformer load as a base, will have a minimum point, which is, theoretically, the economical load for the conditions assumed. A series of such curves are shown in Fig. 3. It is necessary in making such calculations to know the total investment in a transformer installed, the cost of energy delivered to the transformer primary and the characteristics of the load to be carried. These curves show that the economy is improved as the load is increased up to a point that is well beyond 250 per cent rated load for 50 kva. and all smaller sizes. The characteristic loads assumed correspond to residential lighting service.

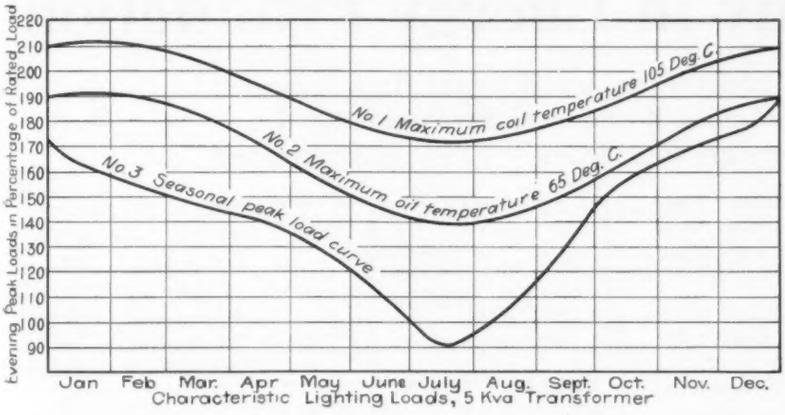
The curves of Fig. 4 show graphically the most economical size of transformer for characteristic loads up to 50 kva. It should be noted from these curves that for any transformer size represented the load at which it is more economical to use the next larger size is well above the maximum that may be safely carried. However, the gain in economy decreases as the load is increased (Fig. 3), so that there is little advantage in increasing the loads above 200 per cent.

Curve 1, Fig. 5, indicates the characteristic loads that may be carried on a 5-kva. transformer throughout the year without exceeding a temperature of 105 deg. C. in the windings. Curve 2 indicates the characteristic loads that may be carried throughout the year without exceeding 65 deg. C. in the oil; that is, the loads at which a temperature indicator would trip if set at 65 deg. C. Both of these curves are based on the assumption that there will be no variation from the normal ambient temperatures of Fig. 1. However, variations in normal temperature from day to day are such that temperature indicators set at 65 deg. C. would indicate overloads consistently at about 165 per cent rated load during the winter months.

It is evident from curve 3, Fig. 5, which is the curve of seasonal peak-load variation, that if an oil temperature of 65 deg. C. is reached at the time of maximum load, the transformer will have carried loads considerably below the maximum during the previous year. The peak lighting loads are very greatly reduced during the summer months when the ambient temperature is high and the overload capacity of the transformer correspondingly low. It is evident from this that compensation for variation in ambient temperatures in the temperature indicator is not essential for such loads. The area bounded by curves 2 and 3 represents the normally unused load capacity of the transformer. Because of the seasonal characteristics of the loads under consideration this reserve can be of use only as an additional factor of safety during the period of occurrence. Periodic inspection for overloads may be made at less frequent intervals during this time than would be required during the period of increasing load previous to the maximum.

Good service requires both proper voltage regulation and freedom from interruptions to service. It is neces-

sary to consider these as limiting factors in plans for reducing transformation costs by increasing the load on transformers. The regulation of a transformer increases in direct proportion to the load, as does also the regulation of primary feeders. It should be possible to compensate approximately for increased transformer regulation by increasing the compensation for feeder regulation. As the required increase would in general be about 1 per cent, this should be possible without changes in substation equipment. Interruptions to service may result from the blowing of primary fuses due to short-circuit disturbances on branches of the secondary system or from burnouts due to excessive loads. Primary fuses on lighting transformers are usually large enough to permit from two to four times rated load on the transformer without blowing. This is necessary in order to prevent them from blowing when short circuits occur that should be cleared by fuses on the customer's premises. The function of such fuses should be to disconnect the transformer from the primary only when trouble develops that might otherwise cause a shutdown of the primary circuit. Primary fuses should not protect the transformer against overloads. If the load on transformers is to be increased, the size of primary fuses must be increased in proportion.



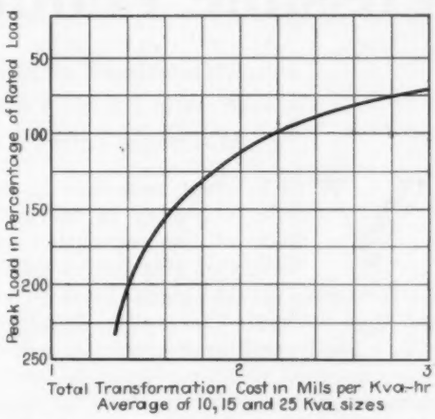


FIG. 5 (LEFT)—LOAD AND TEMPERATURE LIMITS ON 5-KVA. TRANSFORMERS DURING THE YEAR. FIG. 6 (RIGHT)—EFFECT OF INCREASING LOADS ON TRANSFORMATION COSTS USING 10, 15 AND 25-KVA. TRANSFORMERS

At the present time most central-station companies do not attempt, systematically, to carry overloads in excess of 25 per cent on distribution transformers. If greater economy is to be attempted by increasing the loads, it becomes necessary to have a means of frequently checking up for overloads. Inspection for overloads at reasonably frequent intervals, especially at the time of year when maximum peak loads are encountered, should virtually eliminate burnouts due to overloads. Such inspection is readily made possible by equipping transformers with temperature indicators, which should be adjusted to operate at temperatures sufficiently below the danger point to allow time for routine relief of excessive loads. Such devices should, in order to make frequent inspections practicable, give an indication that may be easily observed without climbing the pole. They should be reliable as to the temperature at which they operate and should be easily reset after operation. With these qualifications the cost of frequent inspection should not greatly exceed that of the old method of making instantaneous current readings.

The maximum permissible oil temperature varies somewhat in different sizes and types of transformers. In general, at the maximum safe coil temperatures the oil temperatures are slightly higher in larger sizes; that is, the temperature gradient is less, so that a temperature indicator adjusted to indicate overloads on a small transformer would not allow the maximum load on a larger size. However, the economy curves (Fig. 4) show that as the load is increased the gain in economy decreases. This is more particularly true of the larger sizes, so that an oil temperature limit which would give maximum economy on small transformers would also result in very nearly maximum economy in the larger sizes. For practical purposes a standard temperature setting for all sizes is desirable.

The normal maximum demand on transformers is about 100 per cent rated load when the maximum demand on individual transformers is normally limited to 125 per cent rating. This is representative of the best conditions obtained at the present time. If the peak loads are increased to approximately 165 per cent rating by operating on a temperature basis, a normal maximum demand of 150 per cent rating is probable, indicating a general increase in load of 50 per cent of the transformer ratings to be possible without increase in transformer capacity. The normal maximum demand on the distribution systems of many companies is 80 per cent or less of the total rated capacity of transformers connected.

The effect of increasing the loads on the transformation costs for 10, 15 and 25-kva. transformers is shown in Fig. 6. These sizes represent the greater part of the transformers carrying residential lighting loads in larger cities. If the peak loads on these sizes are increased from 100 to 150 per cent rating, the decrease in cost per kilovolt-ampere hour is 0.55 mill, representing a reduction on expenditure of 24.1 per cent from that which might be expected if the normal demand remained at 100 per cent.

A large central-station company may have six thousand or more lighting transformers connected to its lines. The total annual charges against this number of transformers would approximate $250,000 per year if the normal maximum demand is 100 per cent rating. Assuming the same load to be carried by transformers operating at a normal maximum demand of 150 per cent rating, the total transformer capacity would be reduced by one-third and the annual costs reduced 24.1 per cent, or approximately $60,000 per year.

Such a change could not be brought about at once without prohibitive expenditures in rebuilding and

rearranging existing systems. However, most companies find it necessary to maintain a steady increase in transformer capacity to take care of increases in load of from 5 to 20 per cent annually. A large proportion of this increase in capacity represents replacements of existing transformers with larger sizes in the same locations, or new installations made in locations near existing transformers, in order to take over part of the load by transferring part of the connected secondary. If temperature indicators were installed on existing transformers, the normal increase in load might in the course of a few years bring about the desired condition of loading on existing transformers. New installations should, of course, give the desired loading.

Operation on a temperature basis should result in a considerable reduction in the annual expenditures required for additional transformer capacity. Until a condition of loading approaching the maximum is realized, this reduction in expenditures should be from 50 to 90 per cent of the expected requirements, depending upon initial load conditions and the rate of increase in load. When the normal loading has been increased as far as practicable on an entire system the annual expenditures for replacements should continue to be about 30 per cent less than the requirements for equal increases in load under the present load condition.

Unless they are very much underloaded, there is little to be gained by replacing transformers rated less than 25 kva. with smaller units, because the cost of replacement will counterbalance the reduction in transformer investment and core losses. Such replacements should be made only where a material reduction in annual charges can be definitely determined. In locations where considerable increases in load may be expected within a few years both the cost of replacement with smaller units and the cost, later, of replacement to provide for increased load must be considered.

Possible Economy in Energy Production

Attainable Economy of 12,500 B.t.u. per Kilowatt-Hour Indicated in A.S.M.E. Papers—Upper Economical Pressure 1,000 Lb.—Materials Limit Temperature to 750 Deg.—Field of Air Heaters

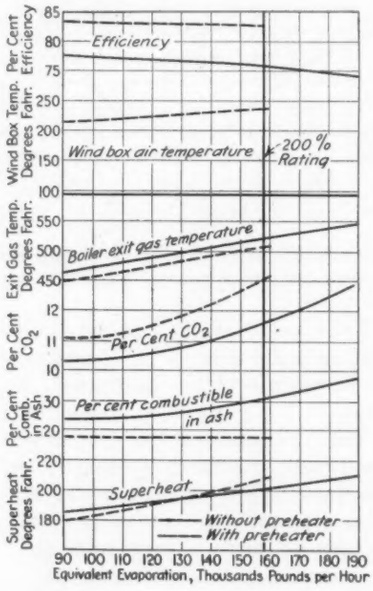
VERY great progress in determining possible economies in energy production was made at the convention of the American Society of Mechanical Engineers last week. Authoritative papers treated ideal cycles and conditions and then attempted to outline definitely the degree to which ideal conditions could be realized in practice. Only reasoned judgment could be used on the various questions because of lack of actual data, but a remarkable uniformity existed in the conclusions reached in the different papers. Particularly valuable was the conclusion that about 1,000 lb. and 750 deg. respectively are the upper economical and practicable limits in pressure and temperature.

A difference of opinion as to the advisability and degree of incorporating bleeding and reheating in station design existed, based on costs, equipment and operating convenience, but both cycles or a combination of the two offer decided possibilities for station economies.

AIR-HEATER TESTS AT COLFAX

Tests on an air preheater installed at the Colfax station of the Duquesne Light Company were described in a paper by C. W. E. Clarke. The air heater was designed and made by the Combustion Engineering Corporation, and the test results were obtained between July 14 and Aug. 4 on a single boiler whose chief details are given in the accompanying table. The air heater was guaranteed to give a wind-box temperature of 235 deg. F. with the boiler having an equivalent evaporation of 144,000 lb. of water per hour from and at 212 deg. F. The curves reproduced show the test results with and without the preheater in service.

Air leakage gave trouble, but welding will help to obviate this in further designs. The performance of the air heater was very satisfactory, particularly as the tests were made on an existing boiler installation. The efficiency increase due to preheated air increased from 5½ per cent at 114 per cent boiler rating to 7 per cent at 200 per cent rating with a flattened curve because of the increase in air-heater heat transmission with increase of temperature and volume of flue gas through the heater. The installation proved to be simple, inexpensive, easy to maintain and to have small operating costs. The energy used to move the air was 5 kw. per ton of coal fired. In addition, the fuel bed was found to be more uniform, the fuel ignited more readily, carbon in ash was reduced and less



PERFORMANCE OF BOILER WITH AND WITHOUT PREHEATED AIR

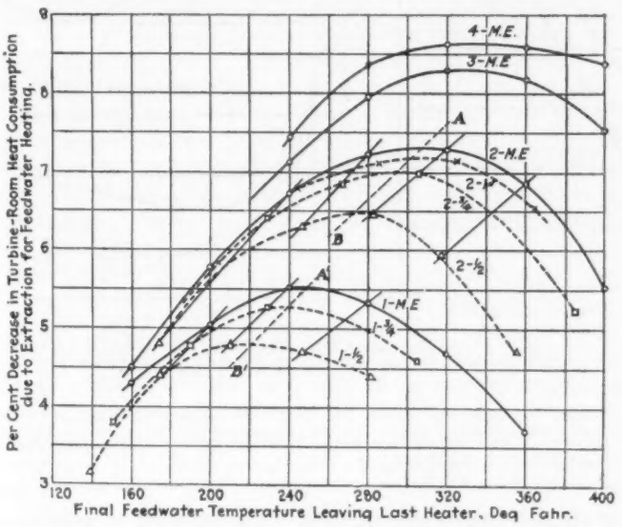
BOILER AND AIR-HEATER DATA

Babcock & Wilcox cross-drum, water-tube-type boiler (installation 1922):
(20 tubes high, 51 tubes wide, 4 in. diameter, 20 ft. long; 60-in.-diameter drum, 34 ft. 1 in. long; setting, 30 ft. 1 in. wide inside of walls.)
Heating surface ..... 22,914 sq.ft.
Steam working pressure per square inch gage ..... 275 lb.
Normal rating (100 per cent), 79,053 lb. of water from and at 212 deg. F.
Babcock & Wilcox superheater, containing 2,999 sq.ft. heating surface, installed in first pass of boiler:
Furnace volume ..... 7,500 cu.ft.
Westinghouse underfeed stoker, 17-retort, 20-tuyère, extra long stoker with side-wall tuyères.
Clinker grinder, grinder, double-roll, separate drive on each side of boiler:
Effective size of grate ..... 29 ft. 10¼ in. x 13 ft. 6 in.
Projected area of grate ..... 218.31 sq.ft.
Grinder pit section ..... 163.89 sq.ft.
Preheating surface ..... 11,200 sq.ft.

trouble was encountered with clinkers. As a result of the tests more air heaters are to be installed in the Colfax station.

HEAT BALANCE WITH BLEEDER CYCLES

The use of bleeding for feed-water heating introduces complications in computing the heat balance of stations and offers several choices as to the number, type and location of heaters. In a paper dealing with this phase of plant operation, E. H. Brown and M. K. Drewry pointed out that three fundamental processes are necessary in computing feed-water heating economies: (a) Determination of the heating value of the extracted steam; (b) computation of the amount of steam to bleed; (c) determination of the effect of bleeding upon output and consequently upon economy.



PERCENTAGE OF HEAT SAVING EFFECTED BY EXTRACTION HEATING WITH DIFFERENT NUMBERS OF HEATERS, AS COMPARED WITH NON-FEED-HEATING OPERATION

Results of accurate computations of complete cycles, considering all extraction variables (with exception of leaving loss) in a typical installation, showing net and comparative turbine-room gains for a representative large-unit high-pressure machine, though applicable to others with small error. Curve 1-M.E. is for a one-heater cycle, most economical load; Curve 2¾ is for a two-heater cycle at three-quarter load, etc.

To get the heating value of the extracted steam the authors recommend the plotting of turbine expansion lines on a Molier chart without any correction for bleeding, using the guaranteed performance data of the manufacturers. For the efficiency of representative generators the authors propose using the following empirical formula:

$$\text{Efficiency} = 0.98 - \frac{0.055}{\sqrt[3]{\frac{\text{kw. rating}}{1{,}000}}} \times \frac{\text{Rating}}{\text{Load}},$$

and to determine the mechanical losses, including bearing friction, gland and pump resistance, etc., the following rule-of-thumb equation is proposed:

$$\text{Mechanical losses} = \frac{4.0}{\sqrt{\frac{\text{kw. rating}}{1{,}000}}}.$$

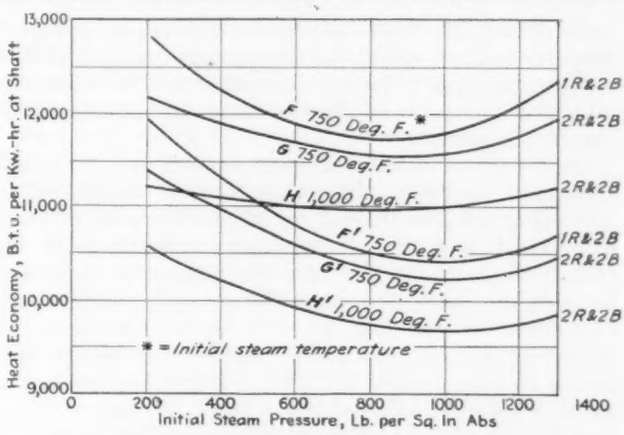
Applying the principles to one-, two-, three- and four-heater cycles, the authors find that the use of multiple heaters makes for the greatest gain in economy and also increases the range of operation over which good economy can be obtained. The proportionate gain in adding heaters decreases rapidly, however, and specific conditions will determine the number to use for a given installation.

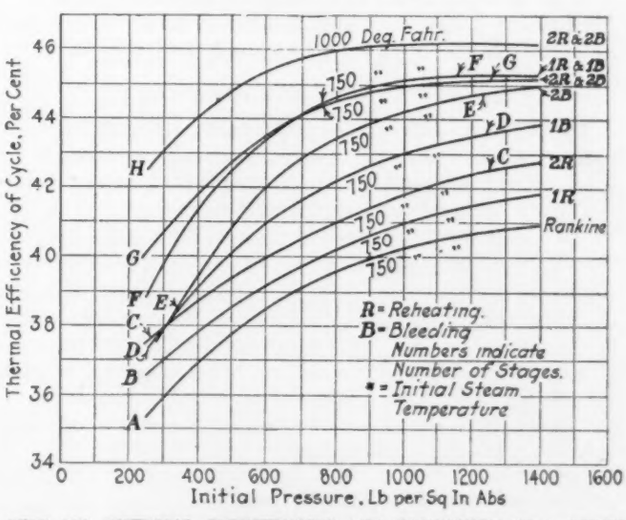
CHARACTERISTICS OF STATION USING 12,000 B.T.U. PER KILOWATT-HOUR

Initial steam pressure per square inch	900 to 950 lb.
Initial steam temperature	750 deg. F.
Back pressure	1 in. Hg
Steam cycle:	
Combination of two reheating stages and two bleeding stages.	
Reheating	120 B.t.u. per stage per lb.
Bleeding	49 lb. and 7.5 in. Hg.
Condensate	280 deg. F. and 180 deg. F.
Steam generator:	
(Surface equally distributed between boiler and economizer.)	
Average rate of heat absorption per square foot per hour	3,000 B.t.u.
Air-preheater surface per square foot of surface in boiler and economizer	0.2 sq.ft.
Boiler, superheater and economizer surface per kilowatt (12,000 ÷ 3,000 × 0.88)	3.52 sq.ft
Boiler, superheater and economizer surface corrected for reheating per kilowatt (1,345 — 248) ÷ (1,345 — 248 + 240) × 3.52	2.89 sq.ft.
Reheating surface per kilowatt	Depends on position
Per cent of total energy absorbed in reheater per kw.-hr. (1,900 B.t.u.)	18
Air-preheater surface per kilowatt (0.2 × 3.52)	0.70 sq.ft.
Temperature of gases escaping from boiler	620 deg. F.
Temperature of gases escaping from economizer	350 deg. F.
Temperature of gases escaping from air preheater	260 deg. F.
Draft loss in boiler and economizer	1 in. water
Draft loss in air preheater	4 to 5 in. water
Fuel: Powdered coal burned with 20 per cent excess air.	

12,000 B.T.U. PER KILOWATT-HOUR

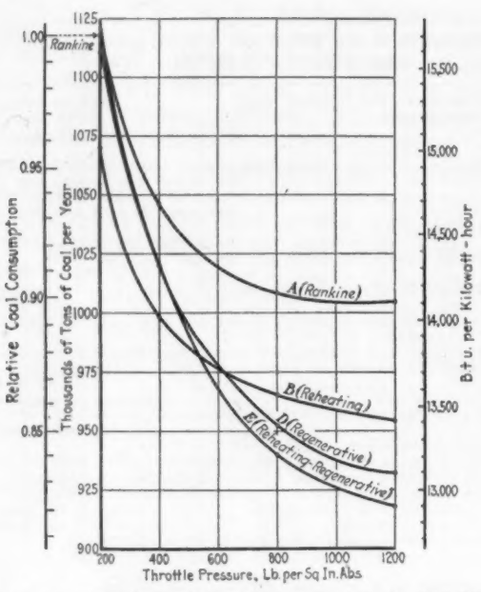
In an able paper on reheating and bleeding cycles for high-pressure stations Prof. W. J. Wohlenberg discussed the theoretical and practical advantages of the cycles for generating stations and arrived at the conclusion that a combination reheating and bleeding

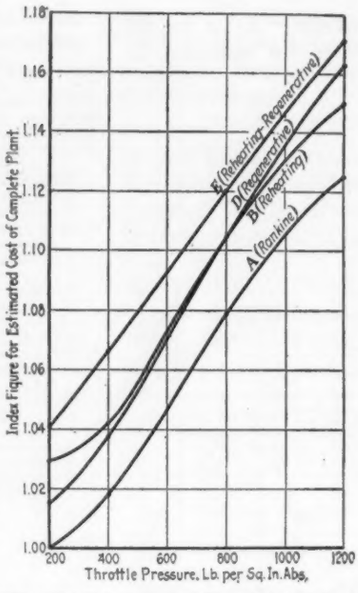




OVER-ALL THERMAL EFFICIENCIES AND ECONOMIES OF A GIVEN STEAM-GENERATING PLANT

(Auxiliaries, electric generator and pipe-line radiation losses not included.)
Curves *D*, *E*, *F*, *G*, and *H* for a stoker-fired plant.
Curves *F'*, *G'*, and *H'* for a powdered-coal maximum-efficiency plant in which steam-generator efficiency is 88 per cent.—Wohlenberg paper.





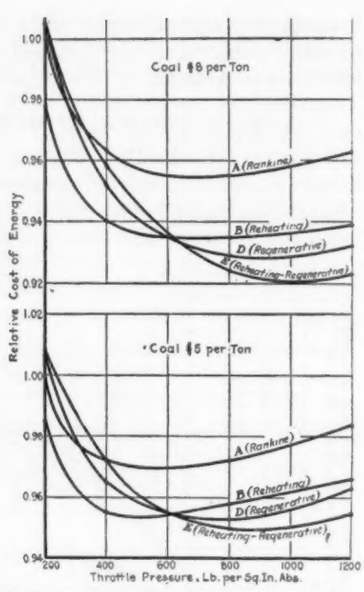


FIG. 1—RELATIVE COAL CONSUMPTION OF 200,000-KW. PLANTS. FIG. 2—ESTIMATED RELATIVE COSTS OF COMPLETE CENTRAL STATIONS, INCLUDING BUILDINGS AND LAND. FIG. 3—EFFECT OF STEAM PRESSURE AND CYCLE ON COST OF ENERGY AT SWITCHBOARD OF 200,000-KW. PLANT

Fig. 1—Capacity factor, 100 per cent; boiler efficiency, 84 per cent; throttle temperature, 700 deg. Fahr.; exhaust pressure, 1 in. Hg abs.; heating value of coal, 12,300 B.t.u. per lb.—Hirshfeld and Ellenwood.

Fig. 3—Capacity factor, 100 per cent; boiler efficiency, 84 per cent; cost of coal, $5 or $8 per ton as indicated; cost of energy taken as 1.00 for the Rankine cycle at 200 lb. per sq.in. abs.—Hirshfeld and Ellenwood.

cycle offered the best opportunity for realizing higher thermal economies. The paper gave an original method for determining machine internal losses by using the adiabatic end point of the expansion process from test data on large units.

As a result of analyses based on 750 deg. F. as the limiting temperature, the author showed that a station producing a kilowatt-hour for 12,000 B.t.u. is in sight and that it will have the characteristics given in the table. He concludes that the best gain in economy can be obtained with the combination cycle with steam conditions of 750 deg. F. and up to pressures not exceeding 800 lb. for stoker plants and 900 lb. for plants burning pulverized fuel. Increasing pressures above the limits indicated will result in an actual reduction in economy. As the optimum condition in stoker-fired plants a figure of 13,000 B.t.u. is given as in sight, and for plants burning pulverized fuel 12,000 B.t.u.

INVESTMENT COSTS ACCENTED

The thermal efficiencies obtainable in high-pressure plants were balanced against investment costs by C. F. Hirshfeld and F. O. Ellenwood in a fine paper dealing with six steam cycles using pressures from 200 lb. to 1,200 lb. and temperatures of 700 deg. and 800 deg. F. On an ideal basis the authors found the bleeding cycle most efficient, but the effect of turbine losses modifies the theoretical conclusions and improves the performance of the reheating cycle. The effect of auxiliary power and losses in other equipment was considered, and Fig. 1 shows the relative performance of these cycles under the conditions given. A detailed analysis of costs of equipment gave results indicated by Fig. 2.

In conclusion the authors favored a high-pressure steam plant using the bleeding cycle as the most practicable for commercial development and said that moisture separators at bleeder points and the use of air preheaters are possible and profitable developments. Pressures above 600 lb. at temperatures between 700 deg. and 750 deg. will, they held, be used in plants as time goes on, and these conditions are warranted by the economies that will be afforded. The reheating cycle was not looked upon as affording the same opportunity for commercial development as the bleeding cycle.

DISCUSSION VALUABLE AND INSTRUCTIVE

In discussing the papers Prof. C. W. Christie stated that air heaters offered a new development with good possibilities for economies under certain conditions, but that more efficient heaters should be developed. He submitted test data which agreed with the use of the adiabatic end point in determining turbine losses as proposed by Professor Wohlenberg and suggested further investigation of the method. He also stated that bleeding from the stages having superheated steam might prove economical under certain conditions.

Sanford Riley cited tests from a French air-heater installation which proved them unwarranted and urged that no generalization be made from any specific set of test data. L. Helander indicated the errors in the approximations used to determine the initial losses in turbines and said that accurate data should be furnished by turbine manufacturers. C. W. E. Clarke suggested that certain stations built on a unit basis might find it profitable to use the cycles and equipment proposed on some of the units, while other units could be installed from a more conservative design standpoint.

N. B. Broido urged the value of reheating and suggested methods and arrangements whereby separately fired reheaters using oil, coal or gas might be used and another arrangement where live steam could be used. He showed performance curves obtained in Europe on a reheating installation which agreed with the predicted performance curves of the papers.

A station operating at 375-lb. pressure is not necessarily more expensive than one operating with 225-lb. pressure, Vern E. Alden maintained. If designers used capacity as the fundamental design conception, costs would very likely be less for the high-pressure stations.

Ice Making with Electric Power

Use of Different Types of Motors in This Important Application—Controls and Switchboard Layouts—Reliability and Simplicity Are Chief Requirements—Typical High-Speed and Low-Speed Plants

ICE making has economical and reliable production as its governing condition, and electricity has found an important application in the industry. The load has been greeted with approval by the utility companies because very frequently off-peak power arrangements can be made, because the load occurs chiefly in summer and acts as a seasonal stabilizer, and because it can be adapted very readily to secure power-factor correction on the system through the use of synchronous motors.

The electric system is particularly well suited to ice making because it can be so cheaply adapted to the various requirements of the business. Large power units in the pump and compressor rooms, small agitator units, portable hoists and power conveyors can be handled economically in spite of the variation in size and the requirements of safety in those locations where workmen and equipment are together in a moist atmosphere.

In general, synchronous motors and induction motors of the squirrel-cage and wound-rotor type serve all power requirements for alternating-current installations and are particularly well adapted to remote and automatic control for the operating conditions encountered. This eliminates the necessity for many workmen and increases the reliability of production.

The general trend in practice in ice-making plants using alternating current for the chief power supply is to use synchronous motors to drive the ammonia compressors only and to use induction motors for the other applications. The synchronous motors are large and well suited to low-speed applications having unity power factor and constant-load operating characteristics. The other applications, such as exciter sets for synchronous motors, brine pumps, water pumps, air compressors, hoists and agitators, are well adapted to induction-motor applications as they are relatively small units, can operate at high speed and operate continuously with a steady load. When unloaders are available for air compressors and local utility rulings permit, only squirrel-cage induction motors are required for all the other applications excepting the hoists and conveyors. Either direct-current motors supplied from the exciter sets or wound-rotor induction motors can be used for these jobs. The use of synchronous motors for small high-speed applications is inadvisable because of their cost, the cost and complexity of their control panels and the more complicated operating rules. In fact, the use of unity-power-factor synchronous motors for the ammonia compressors is preferred to corrective operation because there is less necessity for skilled attendants in the operating room.

Two new ice-making plants have recently been installed in New York City which bring out several points of interest, as one is a low-speed compressor plant and the other a high-speed compressor installation. In one of these plants, that of the J. Chris G. Hupfel Ice Company, the equipment is installed in a remodeled

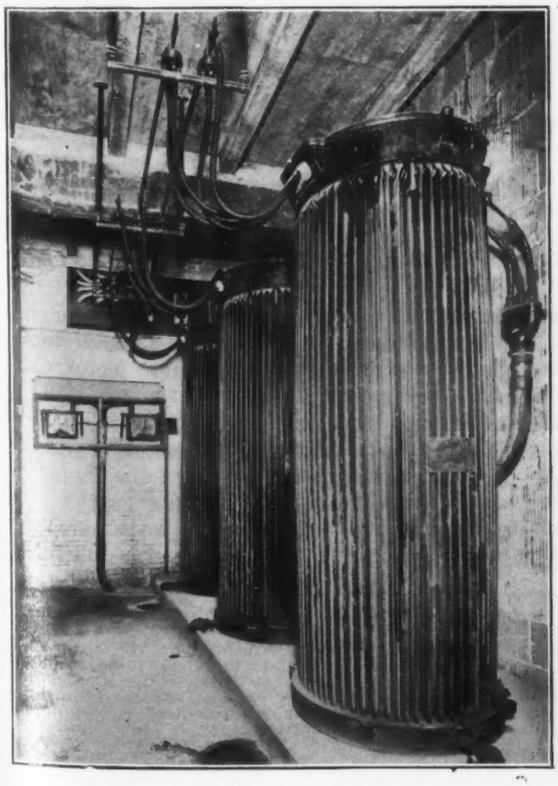


FIG. 1—UNDERGROUND TRANSFORMER VAULT FOR HUPFEL PLANT. TRANSFORMERS HAVE SIX FULL-CAPACITY PRIMARY TAPS

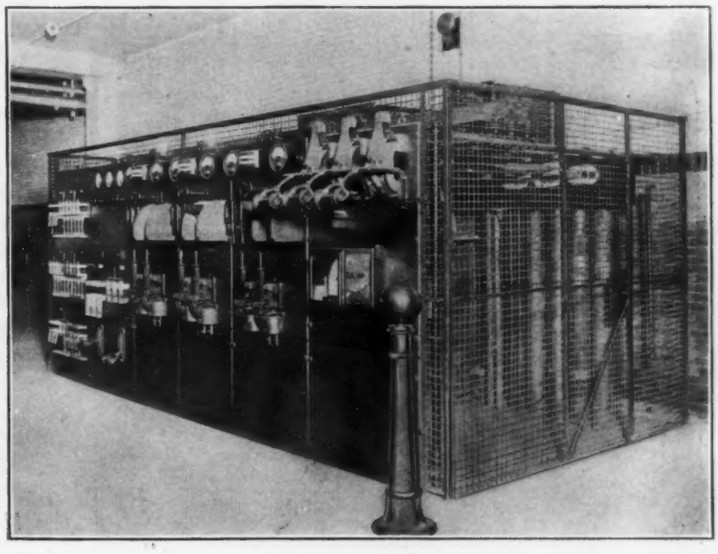
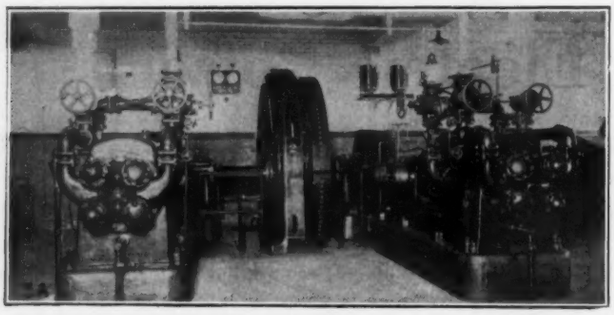
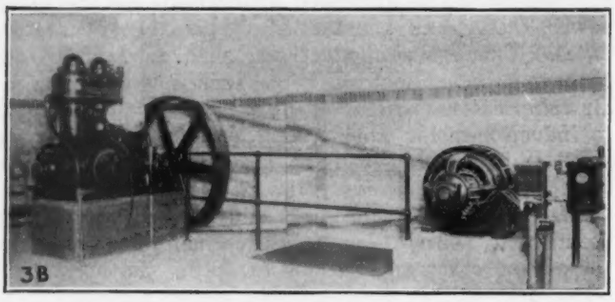
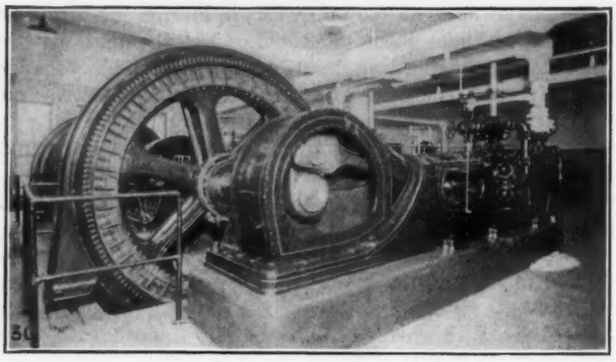
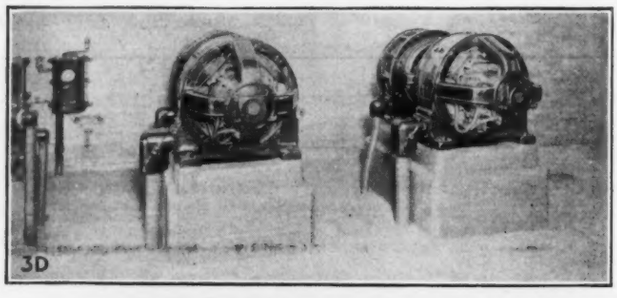


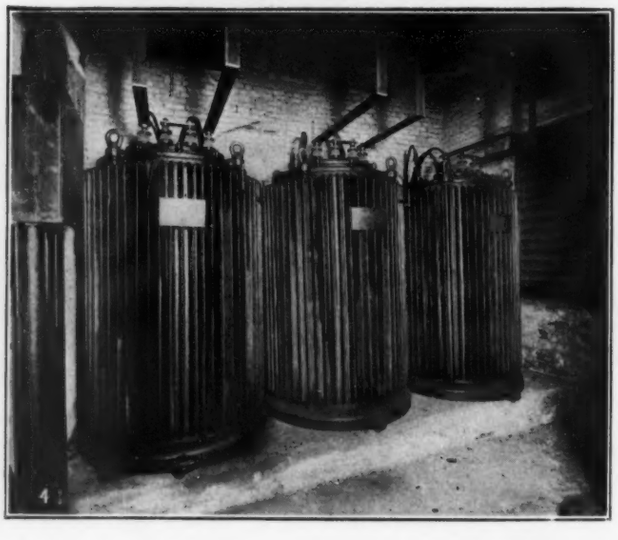
FIG. 2—SWITCHBOARD FOR CONTROLLING OVER 2,000-HP. LOAD OF HUPFEL PLANT
Left to right, incoming panel, three synchronous-motor panels, exciter panel, circuit panel.











brewery building. The plant has a daily capacity of about 275 tons, and the installation involved redesigning the interior and the elimination of a steam-power plant in favor of central-station energy. The United Electric Light & Power Company furnishes service through transformers installed in an underground vault (Fig. 1). This vault is ventilated by forced air which is drawn in at the side of the building and exhausted through the roof. The vault is of hollow-tile construction and the transformers are placed on a platform raised 5 in. above the floor level. The three transformers are supplied at 7,600 volts, three-phase, 60 cycles. Each is rated at 667 kva. and steps down the voltage to 440 kva. for the entire plant supply. The transformers have full-capacity taps of 7,200, 7,500, 7,800, 12,600, 13,200 and 13,800 volts to allow for future changes in the utility's distribution voltage. They are connected delta-delta and all metering is done on the high-tension side.

The energy from these three transformers is used in three ways:

1. Direct to 440-volt, three-phase synchronous motors driving York ammonia compressors.
2. Through a bank of three-25-kva. transformers, 440/220/110 volts, which supply the agitator motors at 220 volts and the ice hoists at 110 volts.
3. Through a 10-kva., 440/110-volt transformer to the plant lights.

ENGINE ROOM AND SWITCHBOARD

The engine room contains the following equipment:

1. Synchronous-motor-driven York ammonia compressor rated at 350 hp., 90 r.p.m.
2. Synchronous-motor-driven York ammonia compressor rated at 450 hp., 80 r.p.m.
3. Synchronous-motor-driven York ammonia compressor rated at 150 hp., 164 r.p.m.
4. Slip-ring motor and belt-driven York ammonia compressor rated at 50 hp., 900 r.p.m.
5. Two exciter sets consisting of 75-hp., 440-volt squirrel-cage induction motors directly connected to 50-kw., 125-volt direct-current generators, 1,200 r.p.m.
6. Six-panel switchboard, consisting of:
   (a) One main panel with curve-drawing watt-hour meter and solenoid breaker.
   (b) Three synchronous-motor panels with starting and running switches, field ammeters, power-factor indicators, alternating-current ammeters, etc.
   (c) One exciter panel with induction-motor starting switches, direct-current switches, etc.
   (d) Lighting circuit panel.
7. Two 50-hp., 900-r.p.m. slip-ring induction motors driving air compressors by belt conections.

The synchronous motors are used because they proved cheapest and best for the low-speed compressors. For the exciters squirrel-cage induction motors are used, and for the air compressors and the small 50-hp. ice-machine slip-ring induction motors are used. Synchronous motors were considered for these applications, but a study showed that the efficiency of the induction motors for the high-speed operation was good, the cost and complexity of controls and switchboards were less, operation was more convenient, wiring was simplified

Fig. 3—Engine-Room Equipment in Hupfel Plant.
(a) Ammonia compressor driven by 450 hp., 80 r.p.m. G.E. unity-power-factor synchronous motor. (b) Small 50-hp. ammonia compressor driven by 900 r.p.m. G.E. slipring induction motor. (c) Ammonia compressor driven by 350-hp., 90 r.p.m. G.E. synchronous motor. (d) Squirrel-cage motor and direct-current generators for excitation and direct-current supply, 1,200 r.p.m.

Fig. 4—Transformer Vault of New Colonial Plant.

and the effect of power factor on a total plant load of 2,000 hp. through the operation of these units was practically negligible. The switchboard cost and complexity are decidedly greater for synchronous motors. Each synchronous motor requires a complete panel and added equipment, so that the cost increases about 20 per cent in comparison with the use of induction motors. Moreover, the heavy starting torque and slow acceleration requirements on the air-compressor installations were admirably adapted to slip-ring induction motors.

A feature of the incoming panel on the switchboard is the use of an air breaker which controls all the 440-volt supply to the plant. The cost of a breaker of this capacity was much less than that of an oil breaker; besides, it is much simpler and requires less attention.

In the rear of the synchronous-motor panels are the starting compensators each with taps of approximately 40, 60 and 80 per cent of normal voltage. These are used for starting the synchronous motors. This makes a very flexible arrangement, for the starting voltage can be raised to suit the starting torque required by the ice machine. Disconnecting switches are placed in the rear of these panels which, when open, kill each panel and compensator.

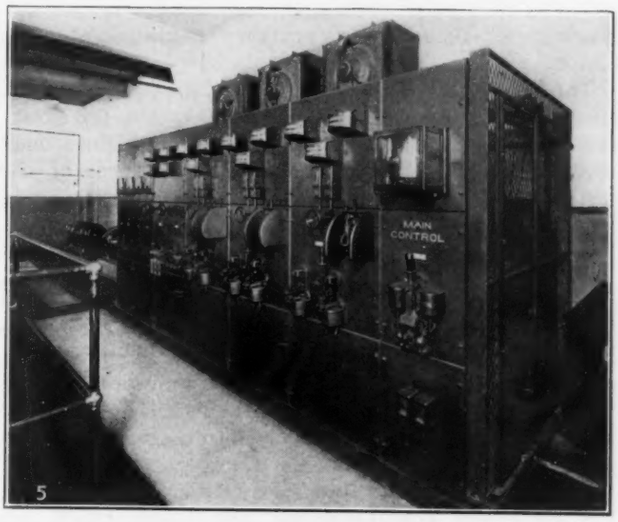
The simplicity of the exciter set control panel is remarkable, one 32-in. panel controlling the alternating-current and direct-current ends. Two DPST knife switches, unfused, each with equalizer for parallel operation when desirable, serve the direct-current ends, and two starting compensator switches with overload and low-voltage releases serve the induction motor or the alternating-current ends.

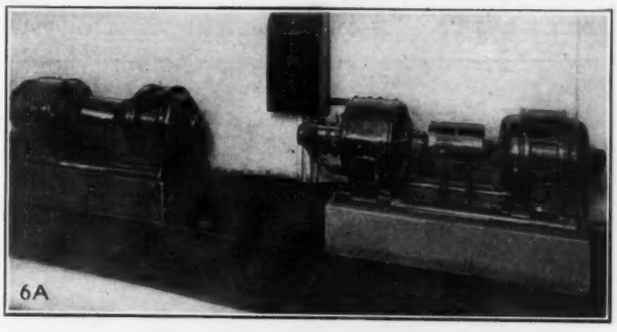
Other Equipment

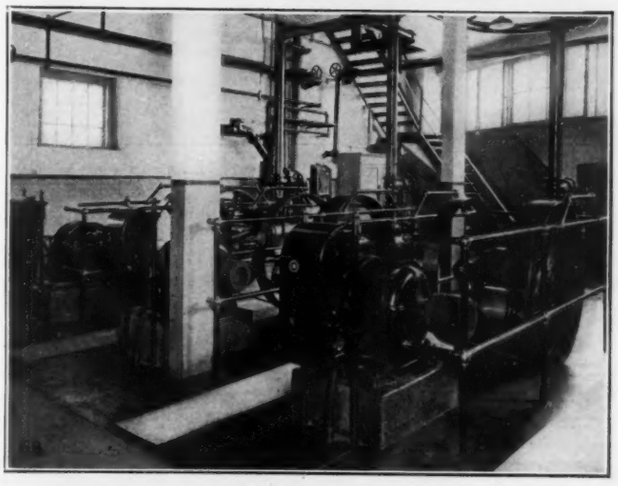
A reliable circulating-water supply to the ammonia condensers is essential in ice making, and in this plant two centrifugal pumps are placed on the roof. These are driven by two 30-hp. directly connected squirrel-cage, 440-volt, 1,200-r.p.m. induction motors. These pumps lift water to the cooling tower on the roof and maintain the flow in the closed circulating system. Signal lights are placed in the engine room behind the switchboard so that the plant engineer can have a continuous indication when the motors are operating.

For driving the brine pumps, three single-phase, 440-volt, 1,800-r.p.m. squirrel-cage motors are used. A 25-hp. direct-current motor, supplied from the exciter sets, is used to drive the ice elevator, and two 1½-hp. direct-current motors drive conveyors used in ice floor haulage. A pipe shop and a woodworking department contained in the building use several alternating-current and direct-current motors. These are all controlled by circuit switches on the panel in the engine room.

For the agitators eight 3-hp., 1,200-r.p.m. vertically mounted squirrel-cage motors are used with General







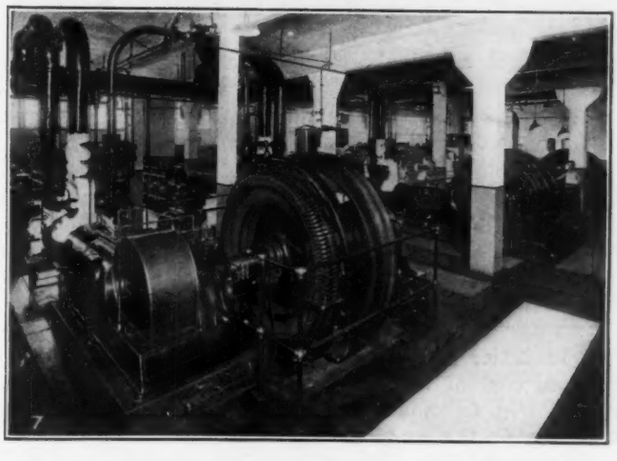


Fig. 5—Switchboard Controlling 1,600 Hp. Load in New Colonial Plant.
Note use of oil breaker on incoming panel and the simplicity of exciter and circuit panels on the left.

Fig. 6—Exciters and Compressors in New Colonial Plant.
(a) Two 25-kw. G.E. induction motor-generator sets controlled by push button station and automatic compensators. (b) Three 50-hp., 1,200-r.p.m. air compressors driven by G. E. squirrel-cage induction motors equipped with compensators and unloaders.

Fig. 7—Three 450-Hp., 180-R.P.M. G.E. Synchronous Motors Drive the Ammonia Compressors in the New Colonial Plant.

Electric CR-1038 safety switches mounted at each motor.

The Yale and Towne hoists on the ice floors are operated at 110 volts, three-phase, 60 cycles, for safety reasons, as moisture is present and operators may receive shocks. Figs. 2 and 3 show features of the installation.

A HIGH-SPEED PLANT

The plant of the New Colonial Ice Company, Inc., in New York has a daily capacity of 375 tons and differs quite materially in its electrical equipment from the Hupfel plant. The United Electric Light & Power Company serves this plant in an underground transformer vault that differs from the other installation in that ventilating air is drawn directly into the vault through an opening in the wall and is exhausted at the top by the use of a 24-in. fan in a false ceiling. Fig. 4 shows the vault and transformers. The transformers are 400-kva., 7,600/440 volts, and supply the entire plant through a delta-delta connection. In the same vault with the main transformers are three 15-kva., 440/110-volt transformers for supplying lighting circuits and the ice hoists.

In the engine room three 450-hp., 180-r.p.m. synchronous motors are directly connected to De La Vergne ammonia compressors; three 50-hp., 1,200-r.p.m. squirrel-cage induction motors drive air compressors by belt connection, and a 50-hp., 900-r.p.m. squirrel-cage induction motor drives a small ammonia compressor. The switchboard is a six-panel General Electric unit very similar to that used in the Hupfel plant, but an oil breaker is used on the incoming panel instead of an air breaker. Its cost was little, the horsepower capacity of the plant being not so great as that of the Hupfel company.

The exciter sets are 25-kw. G. E. units, squirrel-cage induction motors driving direct-current generators. The alternating-current ends of the sets are controlled by start-and-stop push-button stations which operate automatic compensators on the wall back of the sets. A view of the circuit panel (Fig. 5) shows the simplicity of the switchboard control for the induction-motor circuits. This is reflected in a reduced cost of installation and greater ease in operation. Fig. 6a shows the exciter sets and compensators and Fig. 6b the compressors.

An unusual feature of the three 50-hp. air-compressor installations is the use of squirrel-cage induction motors. This is made possible by the use of unloaders in the belt drive, and the installation is very satisfactory from both a cost and an operating standpoint. Fig. 7 shows a view of the three synchronous-motor installations on the ammonia compressors.

On the roof two 50-hp., 1,800-r.p.m. squirrel-cage motors are used to drive Gould centrifugal pumps, and in the roof pump house two 3-hp., 1,200-r.p.m., squirrel-cage motors drive pumps for supplying the make-up water. These installations are controlled by push-button stations and by G. E. CR-1038 safety switches having inverse-time-limit protection. Ten 3-hp., 1,200-r.p.m. squirrel-cage induction motors operate the agitators and are also equipped with the same type of "safety-first" switches. Two 5-hp., 1,800-r.p.m. squirrel-cage motors drive the brine pumps and are equipped with the same type of control and protection as the other pump installations.

In the New Colonial plant the four Sprague ice hoists are equipped with both traction and hoist motors. All have the 110-volt, three-phase slip-ring type of induction motor.

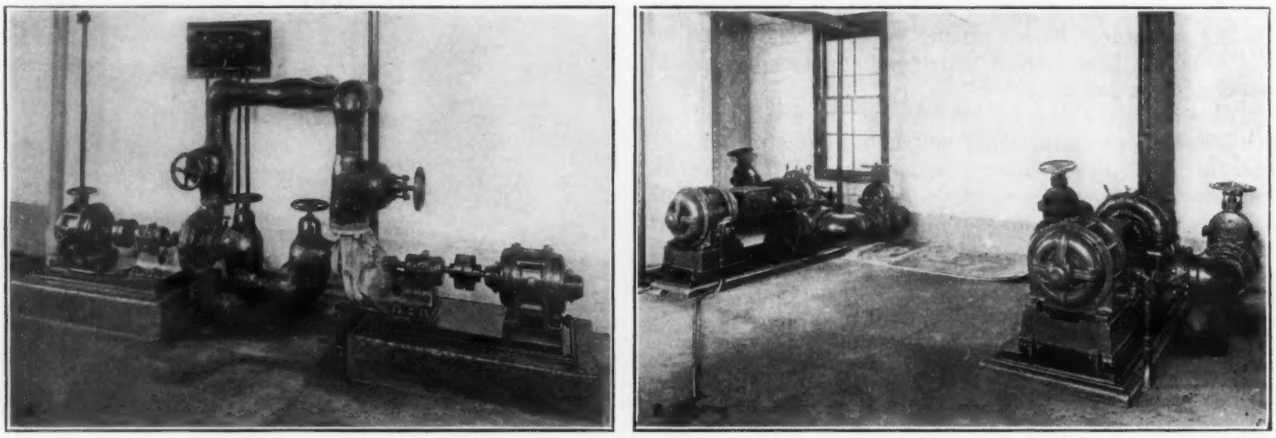


FIG. 8—PUMP INSTALLATIONS AT NEW COLONIAL PLANT
(a) Two 5-hp., 1,800-r.p.m. G.E. squirrel-cage motors driving brine pumps. (b) Two 50-hp., 1,800-r.p.m. G.E. squirrel-cage motors driving centrifugal pump supplying circulating water.

The general features outlined for the Hupfel plant governed the installation at the New Colonial plant. The synchronous motors proved best for the ammonia compressors and are rated for unity power factor only. Over-all cost and operating considerations led to greater use of squirrel-cage than of slip-ring induction motors in the plant, and the utility company also permitted their use on the air compressors when unloaders could be provided.

The two plants described have been operating successfully for over a year, and the owners are well satisfied with the installations. The governing idea of simplicity, reliability and efficient production has been successfully carried out in each of the installations.

Error in Extending Credit

IN THE article entitled "What It Means to Change from Overhead to Underground," on page 856 of the Oct. 27 issue of the ELECTRICAL WORLD, the company with which R. H. Parmalee is connected was given as the Philadelphia Electric Company. It should have been the Counties Gas & Electric Company, whose central offices are at Philadelphia. The latter company should be credited with the costs given.

An Experiment in Co-operation

A Remarkable Record of Achievement by the New York Electrical Board of Trade in a New Kind of Local Organization, as Reported by Chairman Charles L. Eidlitz to Five Hundred Electrical Men Last Week

IN JUNE last summer it was announced that an electrical board of trade had been organized in New York City as an employers' organization to undertake the fundamental work of harmonizing and co-ordinating the relationships of the associated organized and unorganized groups of electrical men within the metropolitan district. Charles L. Eidlitz, already functioning as "special commissioner," a sort of "Judge Landis" for the electrical contractors, was placed at the head of the new organization with a board of governors elected with terms to expire in January, their responsibility being to serve as an emergency board until the associated groups affiliated with the Electrical Board of Trade could arrange for the election of regular and official representatives.

The Electrical Board of Trade announced at one of its early meetings a platform of twenty definite aims to which its efforts would be directed. At a luncheon meeting at the Hotel Astor, New York City, on Wednesday, Dec. 5, attended by about five hundred men of the electrical industry of New York, including a notable gathering of executives representing a wide variety of interests, Charles L. Eidlitz presented this report of achievements by the board. It sounds a new note in local electrical organization that is of more than local interest. It is a refreshing evidence that there is a way to combat and cure some of the evils that will creep in and do exist in the electrical situation in large cities—provided that a leader of vision, courage and resourcefulness, who enjoys the confidence and respect of the entire community, can be enlisted for the work. Mr. Eidlitz' report, which is here printed almost in full just as he gave it, is a remarkable record of service.

THE first problem presented to the Electrical Board of Trade was that the City Electrical Department was so lax in its methods that contractors were being held up for months on certificates of approval, thus tying up their money and in many cases actually threatening their existence. We started a series of newspaper articles and attracted the attention of the public, to say nothing of those holding office in the Electrical Bureau, and by a fearless, but absolutely true, criticism of the department compelled it to realize that we meant business. We opened a department for helping our contractor members get the service which they were entitled to, with the result that today this part of the difficulty has been practically solved and all certificate troubles have been eliminated.

Now, don't get the idea that this helps only the contractor. If the contractor does not get his money, he does not pay his manufacturer or jobber, and if he does not get his certificate, the lighting company does not connect its wires and loses on energy consumption. If the contractor is compelled to spend his time running after certificates day after day, he cannot devote his time to his business, and his failure to furnish a certificate and light as soon as his work is completed is unsatisfactory to his customer and reflects discreditably upon the industry.

Running Down License Frauds

We found that the city license board which is charged with issuing licenses to contractors was not functioning at all and began an active attack on this situation. This has since been straightened out to a considerable degree, and while by no means perfect or satisfactory, I believe one more wallop which we have in mind to hand out shortly will put this into shape. We discovered that the records and methods in the city department were such that almost any one could do work either without a license or by having some one with a license put his work through for him, which is absolutely contrary to law and permitted incompetent men to do business. This condition is rapidly being cleaned up, and the Electrical Bureau in Manhattan and the Bronx is now working right with us in digging up these "bootleggers" and "canning" them. Today no license can be renewed without a personal appearance and a photograph, and I am satisfied that not fewer than 500 to 750 licenses now in existence will never be renewed because the holders do not exist in fact. Thus, this fake has been spiked.

Although the contractors' associations had spent considerable money in an attempt for the last two years to eliminate the special permit, they failed, but under pressure of this organization the Commissioner of Electricity has introduced this amendment to the ordinance himself in the Board of Aldermen, and we have every reason to believe that it will be adopted. This has been the cause of the worst type of construction and one of the greatest fire hazards in the business. Formerly when a concern found itself in financial difficulties the bankruptcy shark lawyers jumped in and picked the carcass clean, and the creditors were silent lookers on. Since we have taken hold of some of these conditions the shark has had rather a discouraging time of it.

We have now cleaned up several of these failures, saving from 60 to 75 cents on the dollar for creditors where nothing would have been left had the sharks got in. The result has been that as soon as a concern finds itself shaky it brings its balance sheet to us, and with our ability to reach the creditors we have only recently saved two concerns from difficulty and their troubles were never known to any one except one or two of their large creditors who helped them over the hurdle. We have established by our methods of handling these cases a rather new angle in business—that is, that if a man is honest but is in a temporary "jam," he should be aided, but if dishonest he should be put out of the industry. We are about to put one out very shortly, and if I have my way, we will aid in sending him where business will be the least of his troubles.

Owing to the fact that we have no personal interest in these cases we are able to get the absolute truth, and this results in having constantly increasing credit information which could not be got in any other way. We are now being recognized to such an extent that our request for detailed statements brings them to us at once.

Those who are using the board for this informa-

tion have expressed themselves as greatly surprised at what we can get for them.

Early in our being it was discovered that the electrical engineer and the architect were specifying in a way that led to misunderstanding and expense, to say nothing of loss and lawsuits. Meetings were held, committees appointed under the auspices of the board, and within a week or so practically all of these conditions will have been cleaned up by mutual agreement, and the results will be broadcasted by this board so that they will be recognized by all.

SMOKING OUT UNFAIR COMPETITION

Difficulties arose in August between certain jobbers and utilities. An investigation by us showed conclusively that an injustice had been done the jobber, but unintentionally. This has been stopped and will probably never happen again.

Certain department stores in an attempt to sell dry goods used a popular device as a leader by advertising it at 39 cents below the price the store paid for it. The business of the concern in question in this locality was actually threatened, and the firm appealed to us. Conferences were arranged, and in less than forty-eight hours we sold the idea to the department store that this was unfair and the "ads" were withdrawn. The company for which we did this was not a member of the board, but we felt the thing was bad for the industry.

We are collecting unpaid bills for members at a constantly increasing rate. All we want to know is that the bill is fair and honest, and if we are convinced of this and the debtor has the money, we come pretty near to getting it or arranging for a settlement.

Architects and owners are daily consulting us as to materials, manufacturers and contractors. We refuse to recommend any particular line or firm, but we are giving them a list for their selection. In many cases they are asking our approval on an individual engineer or contractor, and in those cases we are giving them the answer.

Banks and trust companies are consulting us in an increasing number as to the moral hazard of men in the electrical line when these people open accounts or apply for loans or renew paper, and a number of these banks have stated that they have never before been able to get information of such value to them, and so they keep coming for more all the time. This, of course, is giving us an inside knowledge of what is going on in the finance end of the business, and the more we are questioned the more information we actually get.

Many irregularities in the business—that is, accepting and buying stolen goods—have been corrected by moral suasion. In many cases it is difficult actually to obtain legal proof of these activities, but we have found methods which seem to be operating successfully, and we have compelled a number of people to give up these activities from fear of exposure.

Although we clearly announced that we would not handle labor matters, the unions have insisted on recognizing our board and position and have consulted us in a number of important cases, and our advice and help to both sides has prevented strikes which, if carried out, would have involved large losses to the industry. One case would have meant several hundred thousand dollars' loss by a concern that could stand it; another undoubtedly would have ruined the company.

The public is appealing to us constantly for help concerning lack of attention on the part of public utilities, or failure of contractors to make good, and in every case so far we have been able to give almost instant relief by taking the case up with the utility company or contractor and urging action for the good of the industry.

We are constantly being asked for special types of men, or men with certain qualifications electrically, and have placed quite a number up to the present time, and as time goes on we will undoubtedly be compelled to establish a regular employment department so that competent people when released, owing to no fault of theirs, will not drift and finally leave the business, but will immediately be relocated in other employment, saving a considerable amount in turnover expense.

The Board of Education, through its architect, appealed to us for help in aid of the school building program. Conferences were held, with the result that the end sought has practically been accomplished.

A building loan and group insurance plan is being worked out now which will undoubtedly result in better feeling and will bring comfort to families suddenly bereaved of those on whom they were dependent. By aiding our employees to own their own homes much will be accomplished in the way of making them better and more reliable workers, and a stability will be lent to employment and backbone to the country generally.

It was rumored that certain devices were being imported into this country which were being misrepresented by those marketing them. We purchased some in the open market, have sent them to the Underwriters' Laboratories for a test, and if our suspicions are proved to be correct, we shall broadcast this fraud to the public. It affects practically every utility, jobber and dealer. No other agency could do this without being thought to be acting for its own benefit.

We are at present investigating certain activities of a special, apparently privileged few. We suspect that something rather startling will develop. If we are mistaken, nothing will ever be said of it, but if correct, the scheme will be exposed so that all may be warned.

Our attempted co-operative advertising campaign has been postponed for the present as there are so many activities under way that we have decided to give these a little more time to take root before we launch what will undoubtedly be a *pièce de résistance*.

POSSIBILITIES AHEAD

I have mentioned some of the high spots, but there are hundreds of other matters of importance or of significance. There are many that cannot be referred to at all, not because of any illegality, but because they come to us in a confidential way and any mention, no matter how well disguised, might betray these confidences.

And now, if I may make what I believe is a most conservative estimate, I should say that so far—and we have hardly started—this institution has saved the industry an amount in actual dollars of not less than $500,000 in the few months that it has been in existence. By that I mean moneys that would have been dissipated under conditions existing prior to our organization. I can see now sums away beyond that in the very near future. There is no limit to what we can do. Our value and our activities are limited only by the use to which we are put and the support which we get. We are very young; we should, properly speaking, be in swaddling clothes at our age, but we are even at this moment wearing the trousers of a ten-year-old and pleading for long pants and suspenders.

Finally, back of all this is the fact that we have

established confidence in our fairness, lack of bias, ability to maintain and keep as confidential information furnished as such, which has resulted even in this short time in a condition where no information is refused us, all "bunk is eliminated" and every one is anxious to give us real unvarnished facts without regard to how these may affect his own interests. In other words, we have established in the minds of most people a conviction that we are operating for the good of the individual, the group, the industry and the public, and that service of the highest type and quality is our aim and ideal, that "pussyfooting" and side-stepping are to us unknown methods, but that fearless straight thinking, fair dealing and constructive handling of everything that comes our way—exposing dishonesty, but aiding the honest unbusinesslike individual—are the foundation on which we build.

Recalling Æsop's Fable of the Arab and the Camel

How Small Ground-Return Telephone Companies Have Sometimes Interpreted Help Accorded Them as Setting Up a Principle

By W. J. Canada
Director of Engineering, National Electric Light Association

As EVIDENCE of the danger that lurks in friendly efforts by power utilities to meet much more than half way the situation created where telephone utilities of very limited resources are called upon to bring their systems to modern co-ordinative standards there may be cited the manner in which an informal commission report in Missouri has proceeded from certain incorrect premises to correspondingly incorrect inferences regarding an inductive co-ordination problem involving ground-return telephone circuits. This report is, in a portion of these premises and inferences, so clearly out of step with the trend and weight of recent engineering, economic, commission and court opinion that its issuance, even with its informal character, seems calculated to encourage a recrudescence of the rapidly waning effort of a few ground-return telephone utilities serving few persons to charge up to the power utilities serving many persons the cost of meeting modern conditions of telephone practice.

In this report, known as Case No. 2931, the fact that a power utility had "voluntarily" made contributions to the improvement of one such telephone system was taken to justify the inference that this power utility subscribes to the essential justice of such contributions in this and other cases, and therefore is admitting injustice in not similarly contributing in all other cases.

Proceeding from this informal report, and demonstrating the difficulties entailed in keeping an informal and perhaps carelessly worded report from being unduly quoted to the harm of all concerned, an article in *Telephony* (Nov. 3, 1923) indicates how some persons regard such an "informal" report. The writer of the article took occasion to laud the "line of argument" of the commission, to state that the "principle" set forth by the commission will be of "material help" to small telephone companies, and that such companies "should receive considerable encouragement" from this "order" (note the error in characterization) recently issued.

The report includes several erroneous expressions and implications, and it would appear likely to result in undesirable and unwarranted contentions by misinformed or ill-advised telephone companies, perchance misled further by articles or correspondence such as that noted above. Among the more outstanding errors in the report are repetitions of the statement or idea that "the building and operating of the transmission lines has substantially destroyed telephone service." Connected with this inference is the quotation of a stipulation by which the power utility has "voluntarily" agreed with another telephone company to pay the entire cost of work on the lines owned by the Buffum Telephone Company, necessary to overcome substantial interference brought about by the construction or operation of the transmission lines. From the one fact that the power utility *did* financially assist the Buffum Telephone Company came the inference that the transmission lines *did* substantially interfere with the Buffum service and are interfering with other telephone service now under consideration. This inference is clearly erroneous, the interference being brought about rather by the construction and operation of the telephone systems concerned.

As the writer of the commission report correctly states: "There is no known way whereby even fair service may be obtained over these telephone systems as long as they remain grounded." As he further states correctly: "There is satisfactory testimony in the record to show that most of the telephone lines in question were in a state of bad repair and needed extensive repairs, if not rebuilding." To proceed from these proper statements of fact to the inference that financial assistance from the power company to another telephone company renders such assistance the due of the telephone companies now concerned is a bit of logic which would assuredly not be accepted in any formal decision. Equally illogical would it be to infer from the fact that the power company had entered a stipulation with one company to remedy interference caused by the power system that the power company should also remedy interference caused by the peculiar characteristics of a telephone system.

As with other extensions and advances of our complex civilization that promote and are inseparable from the welfare of the whole community, a peculiar kind of telephone system possesses no inalienable rights, especially none that in the march of industrial, farm and social development would permit that system to remain incongruous or an actual impediment to the community's enjoyment of a more modern order of things.

The extent to which wrong inferences survive is indicated by the fact that in this instance not only were the telephone circuits of a peculiar kind, but they were in very "bad repair."

The highest courts have expressed this fundamental principle with particular reference to similar instances where several sets of facilities needed to be co-ordinated, rather than the responsibility placed on but one.

As summarized by G. F. Deiser in his work on "Conflicting Uses of Electricity":

> If it is at all possible, it would seem that both parties are bound to construct their plant in such manner as not to impair the exercise of other franchise holders. If the telephone apparatus is so delicately constructed that slight disturbances will impair its usefulness, then the remedy lies at the doors of the telephone company. It must adopt means to protect its apparatus from injury.

As summarized in the South African case:

> The principle of Rylands vs. Fletcher applies to a proprietor who stores electricity on his own land if it escapes therefrom and injures a person or the ordinary use of

property. It does not apply to the case of injury done to a peculiar trace apparatus unnecessarily so constructed as to be affected by minute currents of the escaping force.

As summarized by the Supreme Court of Washington State in the Kahlotus case:

The telephone company, in order to maintain its single-wire system, must make use of the earth, in which it has no rights, for the completion of its return circuit. It does not seem reasonable to hold that the duty was not upon it to standardize its line in a way that would prevent interference in accordance with good modern engineering practice, when to maintain a single line it must make use of something which it does not own.

As summarized by the United States Supreme Court in the Erie case:

The Passaic Water Company contends that the expense of moving its pipes cannot be thrown wholly upon it—mainly on the ground that the change of grade was unlawful. This ground fails, and the company must adjust itself to the lawfully changed conditions.

The commission's report is worth study by any one who is particularly interested in this general question.

Letters from Our Readers

A Place Set Apart for Suggestions, Comments and Criticisms, to Which All Men of the Electrical Industry Are Cordially Invited to Contribute

Six Hundred and Sixty City-Owned Plants Abandoned—Why?

To the Editors of the ELECTRICAL WORLD:

The reference in the Nov. 17 issue of the ELECTRICAL WORLD to the abandonment of so many municipally owned plants and the comparisons drawn between the electric rates and the tax rates of localities served by private and those served by municipal plants depict a condition which may without question have a large influence in future operation of many existing utilities. Being interested in the operation of a municipally owned plant, I would call your attention to the development of such an organization, within the midst of large private corporations, wherein the electric rates and tax rate are considerably less under municipal operation than those in the surrounding territories served by private companies. I hold no brief against privately operated public utilities and, as a matter of fact, believe that it would not be possible to operate municipal plants on the scale of these companies, but do believe that there is a broad field for the municipal plant in a moderately sized city, provided that politics can be kept out of the coal pile and the watt-hour meter.

The municipally owned plant of the village of Herkimer, N. Y., started in 1885 with one fifty-light Sperry dynamo, has enjoyed a healthy growth to a modest plant of 1,750 kw. capacity, with a value of roundly $375,000. The amortization of the funded debt and interest charges to date has been cared for from earnings of this department and has never been raised by taxes in any way. During the year which closed Feb. 28 last the receipts from all purposes were roundly $109,000; the net income, after making all deductions, such as uncollectible bills, interest, etc., was roundly $16,000. During this time more than $7,000 was expended for street-light operation for which no return was received. Had this service been rendered at the usual rates, about $10,000 would be added to the net income, making this figure roundly $26,000. Totaling the annual street-lighting costs since the installation of this system, we find that the municipal plant in question has furnished street lighting to the total amount of roundly $115,000, which apparently would more than offset the loss in taxes which would have been paid by a private company.

The tax rate for the village of Herkimer during the past year was $6.39, which is admittedly low, yet the village is referred to as having more and better paved streets than any other village of its size in the state.

The lighting schedule starts at 8½ cents with 10 per cent discount for prompt payment, minimum monthly charge 50 cents; the power rate starts at 6 cents with the same discount, with a minimum charge of $1. Privately owned plants in this territory charge 9¼ cents and 11 cents respectively for the same lighting service and have a minimum rate of $1. They also receive a reasonable payment for street-lighting service, which is proper. Free service of any nature is not proper in either plant.

Possibly the greatest discouragement to the management of a municipally owned plant is what appears to the writer to be the narrow-mindedness of the state and national electrical organizations. If these organizations really mean what they say, that they are for the development of the electrical science, they would admit the managements of the municipal plants; but if they are devoting their energies to the business end of the private plants and issuing propaganda with regard to the municipal plant, then they are not true to the code of ethics which we like to believe exists between engineers.

Inasmuch as a municipal plant can function only within its own governmental territory, which is of course limited in area, and is under the same public service regulations, why can't these organizations work with their municipal companions, building up their systems of generation and distribution along proper lines, so that both parties will be in a position, when the time arrives, for an economical interconnection or complete operation? Would this not be a broader business and financial proposition than entirely neglecting a municipal block of power, as has been done on the interconnection map accompanying the splendid article appearing in the above-mentioned issue of your paper, just because it is municipal?

ARTHUR T. CLARK,
Herkimer, N. Y. Superintendent Municipal Commission.

[In most states private and municipal plants are *not* under the same public service regulations. This fact has made comparisons and co-operation between them and private plants difficult. As to engineering or economic benefits of interconnection, these are naturally to be realized to just as great an extent whether any particular block of power is municipal or private.—EDITORS.]

Government Appointments for Farm Survey

To the Editors of the ELECTRICAL WORLD:

There is an error in facts contained in a news item which appeared on page 1084 of your issue for Nov. 24 under the above title and concerning which it is our desire to establish the correct impression. W. A. Durgin is a member of the Joint Committee on the Relation of Electricity to Agriculture, and his contribution to the contemplated research will consist only in such part of the established service of the Division of Simplified Practice, in the Department of Commerce, as the committee and the related industries may request.

EDWIN W. ELY,
Department of Commerce, Washington, D. C. Division of Simplified Practice.

Central Station and Industrial Practice

Installation, Operation, Maintenance, Test and Repair of
Generation and Distribution Equipment, and Methods of Economically Utilizing
Electric Service in Large Industrial Plants

Extensive Highway Lighting Installation in Pennsylvania

By R. C. L. Greer
Resident Engineer Eastern Pennsylvania Power & Railway Company, Pottsville, Pa.

Approximately 8½ miles of highway lighting, besides the lighting of various side streets of the villages through which these highways pass, has recently been installed and placed in operation by the Eastern Pennsylvania Power & Railway Company. The roads which are lighted are a new concrete state highway from Brockton to Tamaqua and a township dirt road which is a detour from the main highway, passing through the villages of Maryd, Dutch Hill and Tuscarora and joining the main highway again beyond the last-named place.

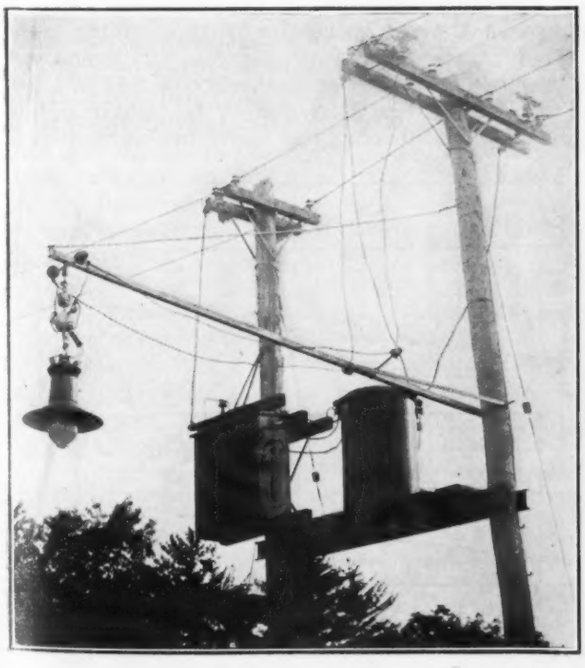
Two types of lamps are used. For highway lighting 133 G. E. Novalux highway lighting units are installed with 250-cp. lamps, while in the villages fifty 600-cp. pendent units suspended on 14-ft. trolley-mast arms are used.

The highway units are installed one foot from the top of 35-ft. poles, making them 28 ft. above the ground. The trolley-mast arm for the pendent unit is 20 ft. from the ground, and the center of the lamp is about 18 in. lower. These lamps are also equipped with absolute cut-outs so that the units may be cut out of service and the lamps removed without affecting the rest of the circuit or endangering the lineman changing the lamp.

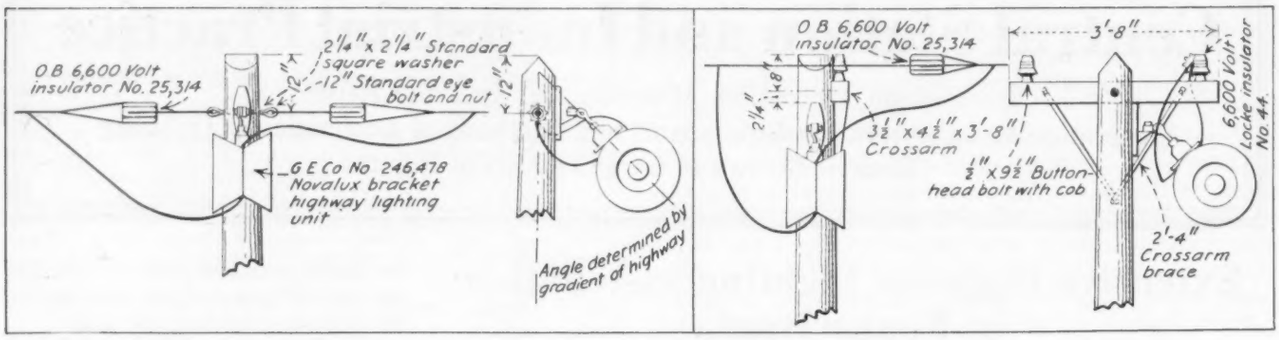
VERY LITTLE LIGHT IS THROWN OUTSIDE OF ROAD AREA

The highway units give a very pleasing illumination for night driving and are mounted high enough to prevent the motorist being affected by their glare. They give a so-called ribbon of light along the highway, and very little of it reaches the woods on either side of the road. Since considerable night trucking as well as pleasure driving is done on these highways, these lights are very beneficial. The expense of installing this system amounts to about $150 per lamp. The 600-cp. units are installed also at important crossroads along the highway. The highway units are installed approximately 300 ft. apart, depending upon the grades and curves in the road. Both types of lighting units are shown herewith, with construction details and method of installation.

In laying out this system it was found necessary to divide it into two circuits. The company already had 2,300-volt service at Brockton and Tamaqua, the two ends of the stretch to be lighted, so it was decided to divide the system at Tuscarora and



OUTDOOR TYPE SERIES LIGHTING TRANSFORMER AND VIEW OF HIGHWAY WITH UNITS ON EVERY OTHER POLE


O B 6,600 Volt insulator No. 25,314
2¼" x 2¼" Standard square washer
12" Standard eye bolt and nut
12"
G E Co No 246,478 Novalux bracket highway lighting unit
Angle determined by gradient of highway
O B 6,600 Volt insulator No. 25,314
3'-8"
2¼"
3½" x 4½" x 3'-8" Crossarm
¾" x 9½" Button-head bolt with cob
6,600 Volt Locke insulator No. 44
2'-4" Crossarm brace

STANDARD TYPE OF CONSTRUCTION FOLLOWED FOR ENTIRE INSTALLATION

feed the circuits from either end. The 600-cp. units are equipped with auto-transformers built into the top of the fixture and using a 20-amp. lamp. Each circuit is supplied by a 20-kw., 6.6-amp., 2,300-volt constant-current transformer installed in a two-pole substation. The meter, current transformer and time switch are mounted in a box on one pole. The transformer is protected by fuse cutouts on the primary side. Lightning protection is taken care of by compression-chamber arresters on the primary side and horn-gap arresters on the secondary side. No. 6 triple-braid weatherproof wire is used for the line wire.

From Brockton to the point where the township road leaves the state road the return wire is on the same pole as the feed wire. From this point to the point where the township road joins the state road again single-wire construction is used. On the pole carrying the lamp the wire is deadened on a 6,600-volt strain insulator. These insulators are fastened on the pole by means of a clevis through an eye bolt and eye nut on the opposite sides of the pole. The pole in between the lamp poles carries the wire on a pressed-steel pole-top pin. For lamp spacing up to 312 ft. only one intermediate pole is used. For the few instances where the spacing is greater than that two poles are used with equidistant spacing.

Combustion Rates and Efficiencies

BY D. C. HESS
Stoker Engineer, Service Department, Westinghouse Electric & Manufacturing Company, Philadelphia

THERE is a certain combustion rate where the stoker and boiler operate at their highest efficiency. This can be determined by running a series of short tests at varying rates of combustion, and therefore an effort should be made to run as near this point as possible. Usually, however, this cannot be done because in the case of a new plant the designing engineers have to consider various elements such as first cost, labor, etc. In the case of old installations it will often be found that the load demand upon the station has outgrown the station, with resultant high capacities. In this discussion it should be considered that the plant will operate at the highest efficiency point. If the plant operates at any other point, the same considerations hold good, but in a lesser degree.

The results of a series of tests using Illinois coal in a six-retort Westinghouse underfeed stoker and a 558-hp. boiler are shown in Fig. 1. The grate area was 105.66 sq.ft. A rating of 328 per cent was obtained. The unit operated most efficiently at 160 per cent of normal boiler rating, when burning approximately 3,300 lb. of coal per hour, 550 lb. per retort or 31.2 lb. per sq.ft. of grate surface.

Results of a series of tests run with Pittsburgh district coal are shown in Fig. 2. Each 650-hp. boiler had a grate area of 123.27 sq.ft., which was supplied with fuel by a seven-retort Westinghouse underfeed stoker. The best efficiency was obtained at 185 per cent of normal boiler rating. It is also interesting to note the similarity between the combined efficiency and CO_2 curves of this test. There was a gradual rise in the flue-gas temperature as the boiler rating was increased.

The results brought out by these tests show the essential conditions which are necessary to maintain the best operation of the stoker equipment. The point of highest com-

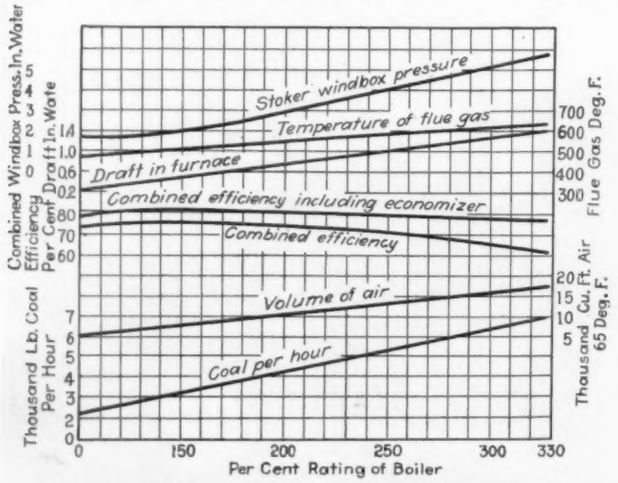


FIG. 1—PERFORMANCE OF A SIX-RETORT WESTINGHOUSE UNDERFEED STOKER FIRING A 558-HP. BOILER
Average B.t.u. of coal as fired = 11,877

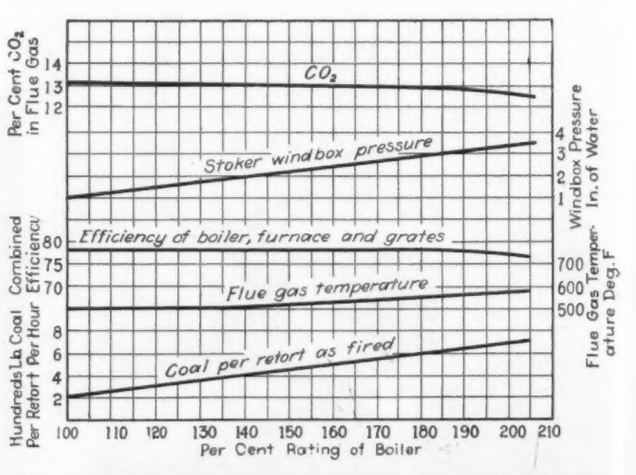

Per Cent CO_2 in Flue Gas
CO_2
Stoker windbox pressure
Efficiency of boiler, furnace and grates
Flue gas temperature
Coal per retort as fired
Hundreds Lb. Coal Per Retort Per Hour
Combined Efficiency
Windbox Pressure In. of Water
Flue Gas Temperature Deg. F
Per Cent Rating of Boiler

FIG. 2—PERFORMANCE OF A SEVEN-RETORT WESTINGHOUSE UNDERFEED STOKER FIRING A 650-HP. BOILER
Average B.t.u. of coal as fired = 12,358

bined efficiency for the first installation is 160 per cent of rating, while with the second installation the best efficiency was obtained between 170 per cent and 185 per cent of rating.

The operating force in this plant has found that it can force this equipment to 328 per cent of rating if necessary. The condition of the furnace after a high rating test will determine the effects of the high temperature on the furnace walls and stoker parts.

The type of stoker and fan driving equipment should be determined by the heat balance of the entire plant. If additional exhaust steam is required for feed water, then engine or turbine drive will be preferable from an economy standpoint. On the other hand, if plenty of exhaust steam is available, it might be preferable to use motor drive.

Messenger-Cable Suspension for Local Distribution

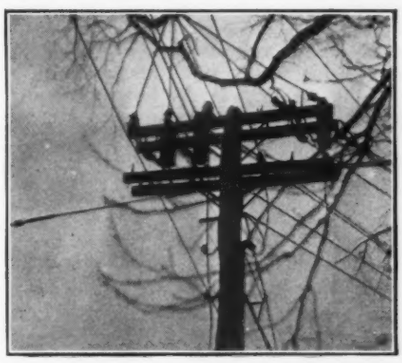
BY F. A. WESTBROOK
Formerly Field Engineer Habirshaw Electric Cable Company, Yonkers, N. Y.

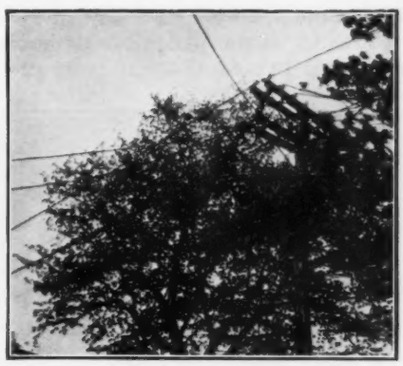
MULTIPLE-CONDUCTOR cables supported by messengers on poles for three-phase power transmission circuits where tree conditions render the use of open-wire construction impracticable have come into general use. However, little has been done about local distribution circuits at primary or secondary voltages under similar conditions. This situation is not so difficult to handle where only comparatively low voltages are involved, and several expedients, such as tree wire and tree guards, have been used with reasonably satisfactory results. Nevertheless, there are cases where these methods are insufficient.

One such case has arisen in the territory of the New York & Queens Electric Light & Power Company. This company has found it necessary to use 4,000-volt, three-wire primary circuits, and in certain sections most of the streets are lined with shade trees. Moreover, the city authorities are very particular about preserving the trees and will not permit any trimming to speak of, which, together with the higher voltage of the circuits, has created a situation where the old methods of tree protection are entirely inadequate.

The difficulty has been solved by running a messenger cable from pole to pole and suspending single-conductor, rubber-insulated and braided wires from them. This has been done by means of marlin hangers, but experiments are now under way to determine the practicability of suspension by means of rings through which the wires can be drawn in the same way as a cable. Wherever there is a space of a block or more which is clear of trees the insulated wires are discontinued and ordinary weatherproof wire supported is substituted.

Of course, the reason why the messenger-wire construction is an improvement is not only that it acts as a mechanical protection to the conductors but also because it is much easier to run one line so that it will not be injured by trees than to see that all the individual wires supported on a cross-arm will be free from interference or will not cause damage to the trees.





WHEN RUNNING WIRES THROUGH TREES SPECIAL INSULATED WIRES FASTENED TO MESSENGER AFFORD AMPLE PROTECTION

Left—Corner pole in trees beyond which the space is clear. The separate wires are fanned out to insulators on a cross-arm. As there is considerable strain at this point they are dead-ended on strain insulators. Sometimes conditions are such that they may pass directly to pin insulators. The method shown here is especially convenient on account of the taps run to the arresters.

Right—Transformer in trees. Note how the wires are run from the transformer to insulators on the cross-arms and are then bunched together and supported by a messenger in each direction.

Single-conductor wires are used instead of a multiple-conductor cable because of the frequent connections which must be made at service transformers in the case of primary circuits and the frequency of aërial service drops to consumers' premises in the case of secondary circuits. If multiple-conductor cable were used it would be necessary to have potheads at every transformer and for every service lead. Furthermore, it would not be so readily possible to resort to open wire and cross-arm construction even in short stretches which are clear of trees.

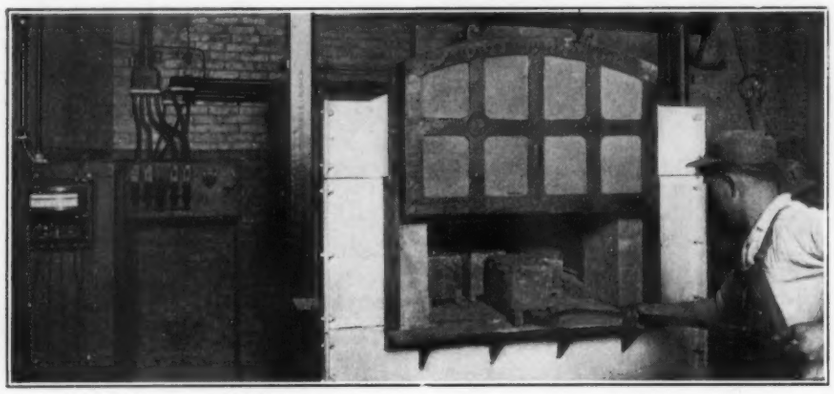
There was one condition encountered by the company's engineers for which there was no warning precedent. This was the action of corona on the rubber insulation. While the action of ozone, resulting from corona, on rubber is well known, it is not generally recognized as a source of trouble at primary voltages; but in this case when the voltage is 4,000 it is enough to cause trouble on the wires bunched together and supported by the messenger. Of course, the corona is not visible to the eye, but there is sufficient electrical stress to cause ionization. This called for a considerable amount of experimenting with different kinds of rubber compound. It was found that the better the grade of compound, that is from the standpoint of increased percentage of raw rubber, the more it cracked and went to pieces under the action of the corona; but by co-operation with manufacturers a compound was finally developed which apparently is not affected. It is obvious that this construction should not be used with either code or ordinary 30 per cent Heavea grades of insulation.

Electric Furnace Displaces Three Coal-Fired Units

FRESH examples of the economies of industrial electric heating emphasize the importance of planning such installations with due regard to engineering analysis. Recently a 75-kw. resistor-type electric furnace was purchased by the Cushman Chuck Company, Hartford, Conn., for use in general heat treating, with particular reference to case-hardening and annealing. The work was formerly done by two and sometimes three coal-fired furnaces, and in addition a gas-heated cyanide furnace was operated at a fuel cost of about $100 per month. The electric furnace has been in use a few

months, and the coal-fired outfits are to be scrapped; one man's time at about $30 per week has been eliminated, and the quality of the work turned out is far superior to that formerly produced on account of the uniformity of the heating.

The electric furnace has a capacity of twelve "pots" used in case-hardening chuck parts. It is operated with a temperature control varying the heating only about 2 deg. F. on either side of an average determined by the amount of energy allowed to flow through the resistors. The furnace can be run at about 1,650 deg. F. maximum or at a desired lower figure. About six hours are required for a single case-hardening run for a carbonization depth of $\frac{1}{32}$ in. The furnace is operated on a day rate of about 2.2 cents per kilowatt-hour, and from 10 p.m. to 7 a.m. on a rate



ELECTRIC FURNACE FOR CASE-HARDENING AND ANNEALING WILL PAY FOR ITSELF WITHIN EIGHTEEN MONTHS

40 per cent less, under the regular schedule of the Hartford Electric Light Company. The total cost of the installation, including furnace, wiring control equipment and additional apparatus such as alloy pots, etc., was about $6,000. It is no longer necessary to operate the cyanide furnace, so that the gas bill is saved, as well as the wage above mentioned.

The electric furnace is run twenty-four hours per day and usually six days per week. The ability to operate the furnace on such a schedule at a substantial percentage of its rating contributes to its economy under the conditions of the Cushman company, the volume of whose business keeps the furnace active most of the time. The average cost of electricity for the furnace is about $200 per month. In the four or five months since its installation the cost of repairs has been practically nil, and it is expected that the furnace will pay for itself within eighteen months.

Organizing Cable Tests for Routine Handling

REFERENCE has been made at various times in these columns to loose-leaf instructions used by engineers and foremen of the Worcester (Mass.) Electric Light Company to facilitate routine work on the distribution system and to insure covering all important points in handling inspection, test and repair tasks. The following instructions for cable testing have lately been added to the other scheduled activities and are reproduced here because of their comprehensiveness:

Instructions for Cable Testing

The meter engineer shall be responsible for the proper testing of all cable when requested to do so. The engineering assistant in charge of records shall be responsible to the general engineer for seeing that this is done.

All used cable before being returned to stock must be tested as follows: 13,000-volt cable to be returned shall be delivered by the line foreman to the transformer room, underneath the high-voltage test room, and all other cable shall be delivered by the line foreman to the basement near the 10,000-volt test set. The foreman shall attach a paper tag to each piece of returned cable stating the length in feet, size of conductor and normal working voltage. He shall also enter the words "Not tested." If there are any pieces over 8 ft. long which appear unfit for use, the day emergency man shall notify the distribution engineer or the general line foreman, who alone may order such pieces junked. In this case a suitable "junk" tag shall be filled out, signed and attached to the piece of cable affected by the man who orders it junked. One section of the tag shall be left attached to the cable; the other section (an exact copy of the first) shall be given by the man who signs it to the engineering assistant in charge of records.

After this, the yard man shall then remove such pieces and may remove pieces less than 8 ft. long without the "junk" tag. The emergency men shall prepare all other pieces for testing as follows: He shall remove the lead sheath for a distance of approximately 6 in. from each end and remove the insulation from one end for a sufficient distance to permit attaching a test terminal to the conductor. Rubber-insulated cables which have a layer of tape between the insulation and lead shall have the tape removed as far back as the lead. Where more than one cable of the same voltage is to be tested the ends of the conductor may be tied together with copper wire. When this is done the coils of the cable should be placed in such a way that the lead sheaths are in contact.

After the cable has been prepared for test the emergency man shall notify the meter engineer that it is ready and he will assign a man to make the test.

The test man assigned by the meter engineer shall be responsible to the meter engineer for the application of the proper voltage to the cable as follows:

1. Cable for 600 volts alternating current or less:

Size of Conductor	Test Voltage
No. 14 to No. 8	3,000
No. 7 to No. 4/0	3,500
250,000 circ.mil and up	4,000

2. Primary cable:

Size of Conductor	Test Voltage
2,300-volt alternating-current	10,000

3. High-voltage cable:

13,200-volt alternating-current	33,000

For intermediate voltages cable having rubber insulation shall be in general tested at a potential equivalent to 1,000 volts for each $\frac{1}{64}$ in. thickness of the rubber insulation up to $\frac{10}{64}$ in., and for greater thickness at 10,000 volts plus 1,500 volts for each $\frac{1}{64}$ in. over $\frac{10}{64}$ in. of insulation thickness.

The test voltage shall be applied for one minute. These tests are based on the A. I. E. E. standards as given in Volume XL (1921), pages 1666-1673, but the duration of the test has been reduced from five minutes to one minute.

The test shall be conducted in the following manner: In case of single-conductor cable the emergency man shall connect one terminal of the twin-wire test lead from the test transformer to the conductor and the other terminal to the lead sheath of the cable to be tested.

After making sure that the emergency man stands guard so that no one may come in contact with the live cable, the test man shall close the primary oil switch on the test transformer and raise the voltage by means of the hand-operated regulator from zero to the required value.

At the end of one minute the test man shall open the primary oil switch. If the cable contains more than one conductor, the test voltage shall be applied between each conductor and all other combined conductors and the sheath—i.e., three-conductor cable requires three tests for A, B and C conductors, first from A to B, C and the sheath combined, second from B to A, C and the sheath combined, and third from C to A, B and the sheath combined.

When cable breaks down under test the emergency man shall cut out the defective part of the cable, and if this operation leaves any piece greater than 8 ft. in length, this piece shall again be tested.

When all cable has been tested the emergency man shall notify the engineering assistant in charge of records of the results of the test. The engineering assistant on receipt of this information shall immediately attach the

proper metal tags and make the proper record of the cable. He shall also see to it that the stock department removes the tested cable from the vicinity of the test transformers.

When used 13,200-volt cable has been tested the engineering assistant in charge of records shall inform the general line foreman, who shall see to it that the ends of this cable are properly sealed. The stock department shall remove the cable from the high-voltage test room to some place in the stock room where this work can be done.

Preventing Water Losses Through Turbine Gates

BY FREDERICK KRUG
Superintendent of Hydro-Electric Plants, Porto Rico Railway, Light & Power Company, Bayamon, Porto Rico.

WHERE the stream-flow and water-storage capacity of hydro-electric plants is such that part of the load is carried at times by auxiliary steam plants, the prevention of loss of water through the plants during dry seasons is of prime importance in promoting economy of system operation. In most plants it is customary to close the main gates of reaction turbines when backing water, as the loss through the wicket gates with full head in the turbine casing is quite heavy, particularly with units that have been in service for some years. In one of the plants in the writer's charge a heavy water loss through turbines after the gates were closed was recently eliminated in the manner described below.

In addition to several larger units, this plant has four 750-hp. horizontal-reaction turbines, operating under a head of 175 ft. These have been in operation since 1907 and have been the subject of considerable repair in runner-seal sections in recent years. Each of these units is provided with a 30-in. main gate, mounted horizontally, which consists of a single sliding disk supported on guides. Both sides of the disk are provided with bronze seal rings, as are also both sides of the valve casing on which the disk rests.

It was noted after closing the gates of these turbines in the usual way that about one-half of full-head pressure was maintained in the turbine casing and considerable water lost into the tailrace. It was at first thought that this was due either to worn gate seal rings or to leaks in the by-pass valves, which were 4 in. in size. However, both were found to be in good condition.

Considerable difficulty was always experienced in attempting to seat the gates, and numerous pinions were broken in this operation. It was also found that the pressure in the turbine casing dropped from a normal of 75 lb. per square inch to about 50 lb. per square inch while seating the gate and with the by-pass valve still open. Calculations on the difference in pressure existing between the upper and lower faces of the gate disks led to the conclusion that in all probability the gates were not properly seated.

The water gates were then closed and the water was removed from the penstocks and the gate disks were examined from the turbine manholes. It was found that the turbine gates each lacked between 1 in. and 2 in. of being completely closed, and the loss of water when the gates were supposedly seated was explained.

This is a condition which gradually developed in the turbines. As the turbine casings became more and more worn at and around the wicket gates the loss of water at these points became greater and greater. As a consequence the 4-in. by-pass valves could not supply the water at a sufficient rate to maintain the turbine pressure as the gates approached closure. The resulting difference in pressure between the upper and lower faces of the gate disks caused so much friction on the disk guides that it was impossible to close the gates completely.

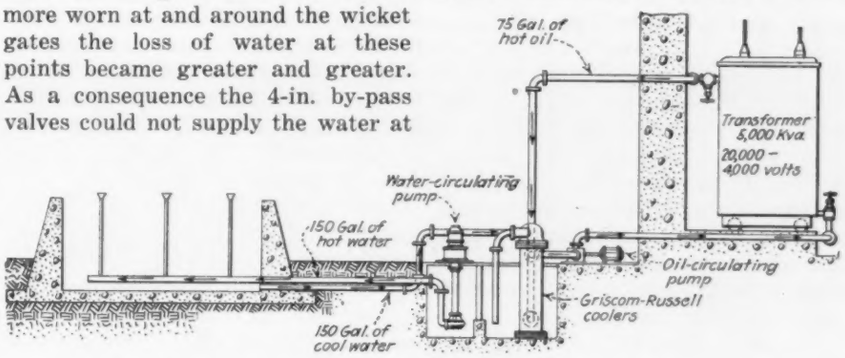
Consideration was given to rebuilding the turbine casings, but because of the expense and the expectation of replacing these units in a few years this was not thought advisable. Based on the loss of water through the wicket gates and the permissible difference in pressure on the two sides of the gate valves to permit their closure, it was estimated that 6-in. by-pass valves would correct the trouble. A by-pass valve and the necessary piping of this size were accordingly installed on one of the turbine gates, and this solved the difficulty in an entirely satisfactory manner. Similar by-pass valves were then installed on the remaining three units with good results.

Forced-Oil-Cooling System for Transformers

BY H. S. FOLEY
Chief Engineer Cia Hidroelectrica e Irrigadora del Chapala, S. A., Guadalajara, Jalisco, Mexico

AS CONSIDERABLE trouble had been experienced with previous water-cooled transformers, this company when reconstructing one of its substations made two new transformers to be force-oil-cooled. The transformers are rated at 5,000 kva., three-phase, 20,000/2,300/4,000 volts each. For cooling the oil two Griscom-Russell coolers are provided. These are installed in a pit below the level of the floor in which the transformers are placed, and the oil is circulated by two rotary pumps.

To avoid the possibility of leakage of water into the oil, a large quantity of water at low pressure is used so that the oil pressure is always greater than that of the oil. To accommodate this amount of water an open tank was built from which the water flows by gravity to the coolers and is discharged into a sump. As the tank has about 3 ft. of water below the ground level and has a cooler provided with a draft tube and on the discharge side, considerably more water is made available in case of necessity. From a hot-water sump the water is returned to the tank by one of the two sump pumps. The discharge to the tank is made through three spray nozzles.


75 Gal. of hot oil
Transformer 5,000 Kva 20,000 – 4000 volts
Water-circulating pump
150 Gal. of hot water
Oil-circulating pump
Griscom-Russell coolers
150 Gal. of cool water

COMBINED WATER AND OIL COOLING SYSTEM FOR COOLING TRANSFORMERS

An interesting feature of this installation is that all of the piping is electrically welded together with the exception of flanges. "T's" were made by burning a hole with the carbon arc in the main, butting the branch to this and welding them together.

All motors are operated from the main switchboard, it being necessary to operate only the valves of the coolers by hand and these are soon to be made remote controlled.

Central Station Business

Advertising, Selling and Service Methods
Commercial Organization and Management, Customer and Trade Relations, Public and Financial Policies, and Reports of Company Plans and Experiences

Accounting and Public Relations*

Amiable Contacts of This Department with Customers Important—Individual Employee Interest Essential for Building Good Will

By E. A. Davis
Accountant Middle West Utilities Company, Chicago

FOR the average-sized company accounting work, in so far as it affects public relations, divides sharply into two separate and distinct functions—(a) direct dealing with the public; (b) indirect dealing with the public. In the first division is the direct contact with the customers at the cashier's window, at the order and complaint desk, and the incoming telephone calls. In the second division come the keeping of the customers' accounts, the rendering of bills, statements and the correspondence with customers. The handling of collections comes under both divisions and is a matter of great importance in its influence on public relations.

Considering their direct contact with the public, the work of the members of the accounting department wields a greater influence for good or for ill on public relations than that of any other classified group of employees of a public utility. To the public, in the case of companies of average size, the accounting people very nearly represent that intangible entity—the company—generally referred to by the public as "the office."

The Original Company

Illustrative of this, let us consider Bill Smith. Bill lives in a rural community of, say, one thousand people. Being mechanically inclined and having a head for business, he thinks an electric plant would do well in the community in which he resides. So he puts his thoughts into action and installs a small gasoline-engine-driven generator, strings wires around the town and sets himself up as a budding public utility owner and operator. Everybody in town knows Bill so that if anything in connection with the service calls for a complaint or correction, it is a simple matter for them to drop in on Bill and have things rectified. Years pass. The town prospers beyond expectations of the most optimistic. Bill begins to learn that financing a public utility in a rapidly growing community is far beyond his ability. As a solution a corporation is organized with ample capital and financial backing to conduct the affairs of the utility successfully. Bill is glad to accept a fair price for his business and to retire from a field which has been giving him much worry for several years.

The new corporation opens and equips a modern office. Modern accounting methods are installed, and immediately a changed condition confronts the community. No longer does the electric plant represent Bill Smith. Hereafter grievances of any nature will not be taken up with Bill but with "the office." So that the accounting department, which comes in contact with the public now, typifies the Bill Smith of former days. Upon it rests the burden of seeing that to each customer who comes in the office with a grievance, be it ever so trivial, is accorded a courteous, sympathetic and patient hearing. Courtesy, sympathy and patience should not be forgotten, because these necessary attributes are the roots of building up good will. Every clerk must bear in mind that to the customer he typifies Bill Smith.

The case of customers coming to the office with their grievances has been stressed particularly for the reason that such cases require the most careful handling; for here public relations are strained, and it is of utmost importance that this condition be relieved. But in daily routine of business in contact with the public a great influence can be exerted toward improving public relations or maintaining good ones. And here again Bill Smith enters the picture. If Bill were on the job, he would very probably be able to greet every customer by name and very likely would inquire as to the state of health of some ailing member of the customer's family, or some other intimate matter. It is this personal touch that creates a friendly atmosphere about a public utility office and brings a favorable reaction from the public. It should be cultivated.

Indirect Contacts

Of first importance in indirect contact with the public is accuracy. Nothing destroys public confidence more quickly than inaccuracies in the rendering of monthly bills and statements. And to discontinue a customer's service for non-payment and then have him present to your gaze a receipted bill for the period is about the most destructive influence on public relations conceivable. Happily it does not occur frequently, but it should not occur at all. It is surprising how deeply an occasional customer's feelings can be wounded by the misspelling of his name on a bill or statement. This is another place where inaccuracies are harmful to the company.

The next item is the matter of neatness — or good housekeeping. Bear in mind that a large percentage of the customers who come in your office are women. A disorderly, untidy office doesn't cause them to feel any pride in the public utility with which they do business. Men, as a rule, are not so observing of such matters, yet while they may not notice them, unconsciously the effect is bad. Let the personal touch enter here, thereby bringing an air of good housekeeping into the office.

A Self-Interest Problem

In conclusion, let us look this subject of public relation squarely in the face and ask ourselves, "What is it all about? Is it something in which we as individuals have only a de-

*A paper presented before the Accounting Section of the Wisconsin Utilities Association, Madison, Wis., Oct. 23, 1923.

tached interest—something that we, as a part of our duties, are supposed to build up and maintain for the benefit of the company?" The answer is, "Most decidedly not." Each public utility employee has a very great and selfish interest at stake. In the first place, he has the selfish interest of his own personal advancement, which will be better assured with a growing and successful public utility company, because a company to qualify in this class requires good public relations as a main essential. Furthermore, if his relations are good, his day-to-day dealings with the public are a pleasure, his lot in life is the happier as a result. His selfish interest, therefore, lies in seeing that those favorable relations are maintained. If the opposite is the case, if poor or bad public relations exist, the company which employs him does not flourish. His own progress accordingly is checked, and his day-to-day dealings with the public are far from being a pleasure. His selfish interest clearly lies in seeing that these relations are improved.

A Central Station Nursery

Public Utility Performs an Unusual Service and Wins Many New Friends

THE San Joaquin Light & Power Corporation played a new part in this year's county fair at Fresno, Cal. and made for itself a brand new circle of admiring friends. Instead of the conventional booth devoted to electrical display, at the instigation of General Manager A. Emory Wishon it installed a nursery for babies, and several hundred mothers rise now in their gratitude to thank the San Joaquin company for a really enjoyable visit to the fair.

The "Kid Kilowatt Day Nursery," as it was called, occupied ground space 75 ft. x 50 ft. and was established under a group of trees on the main street of exhibit buildings. Mothers were invited to leave their babies at the booth, where a doctor, trained nurses and professional kindergarten teachers were constantly on hand.

At one end was partitioned off the real nursery, in connection with which was a mother's rest room. Each mother registered her name and address and received a number tag, a duplicate of which was pinned to the baby's dress. Around the nursery was ranged a row of cribs. Certified milk was kept in an electric Frigidaire machine and electric bottle warmers and sterilizers were also used. The room was heated with electric heaters. So popular did the nursery prove that three nurses were kept almost constantly busy, many mothers leaving their little ones at the company's nursery for hours at a time.

At the opposite end of the booth

VIEWS OF THE SAN JOAQUIN LIGHT & POWER CORPORATION'S "KID KILOWATT DAY NURSERY"

was a play yard, 25 ft. square, covered with a foot of clean beach sand. Here the toddlers up to five years old were cared for. Mothers were registered here, too, and the children were tagged. Seesaws, wheelbarrows, buckets, spades and other toys were provided, while the kindergarten teachers devised games, told fairy stories and supervised the play. Toy electric stoves were installed, and the little girls received lessons in biscuit making.

As a third element of service an emergency hospital was conducted, under the supervision of Dr. C. A. Mordoff, head of the company's medical department. During the week of the fair forty patients were treated at the hospital. The nursery took care of 150 babies, all of bottle age, while more than 400 toddlers were checked into the playground, 110 being checked in during a single afternoon.

In the opinion of Mr. Wishon and his organization, the experiment was a far greater success than had been anticipated. The very novelty of it had news appeal that the press immediately sensed, and much publicity resulted.

While there was no direct advertising, the use of electrical appliances was splendid indirect advertising. But above all else, declared Mr. Wishon, there was organizational satisfaction in the rendering of a real service, and beyond any question public good will was strengthened, as manifested by the many expressions of appreciation. A letter of thanks from the management of the fair declares that the day nursery was one of the best of its attractions. The nursery is to be a permanent institution, and plans have already been made to enlarge it next year and to introduce many new features.

An Employees' Service Guide

EVERY utility company which has recognized the full significance of its relations with the public has undoubtedly tried to impress upon its employees the responsibilities which they have in making these relations as friendly as possible. In some cases executives have tried to do this by calling in their department heads, impressing upon them the importance of the matter, and leaving it to them to adopt ways and means of bringing about the desired result.

If company executives are sincere in their appeal and forceful enough in demanding action, this method is often the best because it allows each department head to exercise his own ingenuity and gives him an opportunity to show relative performance. However, it has usually been found that the best results are attained where the chief executive is so imbued with a definite policy toward the public that this spirit is automatically carried down to the individual employees. The policy may not be the product of his own mind, but the chief executive must be its strongest proponent if the employees are expected to reflect it.

Employees' Service Guide

OUR CUSTOMERS judge this company by what they think of you.

COURTESY ALWAYS PAYS and you are paid to be courteous.

NEVER LOOK UPON a customer's complaint as a nuisance. If justified, it is a service to the company, but justified or not, it affords an opportunity for courteous service.

IT TAKES TWO to make service perfect, the server and the served, and you are responsible for your part.

A CUSTOMER will believe what you know to be true. Do not ask him to believe what you do not believe yourself. Get the facts!

OLD CUSTOMERS were once new customers who were fairly treated.

THE RECOLLECTION of courteous treatment remains when everything else is forgotten.

IT IS A CUSTOMER'S RIGHT to understand what he is buying. It is your duty to help the customer to understand.

BEST OF ALL! Put yourself in the customer's place, and then do unto the customer as you would be done by.

Illinois Power & Light Corporation

Wm. A. Baehr,
Vice-President and General Manager.

In the Illinois Power & Light Corporation, which operates chiefly in southwestern Illinois, the vice-president and general-manager, William A. Baehr, has had the accompanying employees' service guide posted conspicuously in all of the company's offices and plants. A copy has been given to each employee. It is printed in the company house organ and it is displayed in public so that the employees know what the company desires the public to expect from them.

What Other Companies Are Doing

Fitchburg, Mass.—A new local record for meter gains was made during October by the Fitchburg Gas & Electric Light Company when 195 units were added to the system. The company gained 1,294 meters during the first ten months of this year. There are 9,300 homes in Fitchburg, and 6,500 of these are now wired.

Sioux City, Iowa. — Three hundred employees of the Sioux City Gas & Electric Company, have pledged themselves to assist in the sale of $600,000 preferred stock, the floating of which was announced recently. W. J. Bertke, vice-president and general manager of the company, occupied the chair at a general discussion of the personal sales compaign which is to be carried on by the employees themselves.

San Diego, Cal. — The Electric Club of this city has arranged with the educational authorities to co-operate with it in the vocational education and guidance work of the schools. It is planned to have instructors from the high schools meet with committees of the Electric Club to discuss ways of making the courses up to date and practical from the industrial standpoint. One feature is to have students taking electrical courses interview the electrical men of the city on the practical aspects of their work.

Providence, R. I. — During the first eight months of 1923 the Narragansett Electric Lighting Company made a 8,209.5-kva. net gain in transformers in use, installed 4,236 new aërial services, 120 new underground services, set 1,192 new poles and erected 183 new street lights. In addition, hundreds of customers have been changed over from 250-volt to 104-volt service, the latter having been made standard on the Narragansett lighting system after many years of experience with the higher voltage.

Janesville, Wis. — For the purpose of promoting a closer relationship between utility companies an inter-utility meeting and banquet was recently held for the first time in the history of Wisconsin utility circles. It was attended by 130 executives and employees of all the public utility companies in this city, representing electric, electric railways, gas, water, telephone and telegraph services.

Digest of Electrical Literature

Including Brief Abstracts of and References to
Important Articles Appearing in the Scientific and Engineering Press
from All Parts of the World

Hydro-Electric Development and Steam Equipment

Powdered Coal in Blast-Furnace Gas Plant.—In a boiler installation in the Ensley works of the Tennessee Coal, Iron & Railroad Company powdered coal supplements blast-furnace gas to maintain uniform supply of steam. Outstanding features of the plant are the automatic control of the air mixture and the feed of the powdered coal. —*Power*, Nov. 6, 1923.

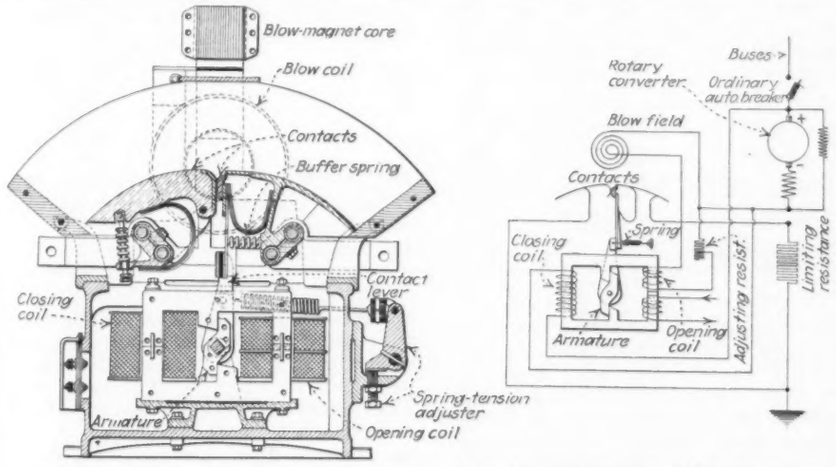
Economical Limits of Boiler Loading. —C. F. WADE.—The factors which will determine the upper unit of economical loading of any given boiler plant will vary with the local conditions obtaining in each individual plant, and are the available draft power, draft system, labor costs and class and quality of fuel used.—*Electrical Review (England)*, Nov. 9, 1923.

Mercury in Binary-Fluid Turbines.—W. J. KEARTON.—In a recent paper presented before the British Institution of Mechanical Engineers the author first discussed very briefly the methods of improving the efficiency of large steam turbines and then outlined the possibilities of the binary-fluid turbine with mercury and water as the working substances. After briefly describing a suggested form of pipe joint designed to prevent the escape of the very poisonous mercury vapor and discussing an arrangement of a combined mercury-vapor and steam-turbine plant, the paper deals with the thermodynamics of the subject. A somewhat involved explanation of the gain sought by using the binary-fluid principle is followed by an attempt to evaluate the relative economies of a pure steam turbine plant and one of the same output using steam and mercury vapor. Attention is given to incidentals, such as the choice of steam pressure in a binary-fluid turbine plant and the flow of mercury vapor through nozzles, while in an appendix tables are given on the thermal properties of mercury vapor after the manner of the more familiar steam tables.—*Engineering (England)*, Nov. 23 and 30, 1923.

Advance in Steam-Boiler Practice in Anthracite Region—M. M. PRICE.—The importance of burning small sizes of coal at mines, changes in boiler and furnace design to insure efficient combustion, benefits of high stacks and the use of economizers for increasing the boiler capacity are among the subjects discussed in this six-page article.—*Coal Age*, Nov. 22, 1923.

Generation, Control, Switching and Protection

Extra-Rapid Automatic Circuit Breaker.—P. FORGET and L. WASSER.—To prevent flashing of the commutator on a rotary converter under short circuit, quick-opening circuit breakers have been developed which are capable of opening the direct current within the critical time of less than one-half cycle of the alternating current, or a speed of 0.003 second to 0.006 second. This paper gives a very detailed description of the breaker, recently built and tested by an Alsatian concern. Theoretical investigations have indicated that an electromagnetic tripping of contacts under spring tension does not give a sufficiently high speed. This new breaker is held closed by a constant magnetic pull against heavy springs and opened by the sudden collapse of this field, achieved by an auxiliary counter-field set up by the short circuit. To obtain high speed the moving armature is made very light (less than 2 lb. for a 750-amp. breaker), the spring tension is very high (400 lb.) and the opening contact has a very short travel (about ⅛ in.). These combined factors give the contact an acceleration of about 2,000 ft. per second per second. A powerful magnetic blow field is provided, the density of which reaches 10,000 gauss. Assuming a current of 7,000 amp., this blow field will exert a force of 14 lb. upon each half-inch length of arc. Tests with this breaker on an 800-kw., 500-volt rotary under a dead short circuit disclosed, by oscillograms taken, an opening time of about 0.005 second. This breaker is not used to open the circuit completely, but inserts into the circuit a protective resistance, normally short-circuited, which limits the current.—*Bulletin de la Société Alsacienne de Constructions Mécaniques*, October, 1923.



QUICK-ACTING BREAKER INSERTS RESISTANCE INTO CIRCUIT WITHIN 0.003 SECOND

Time Lag in Building Up Voltage of Self-Excited Direct-Current Generators. —Y. WATANABE.—A simple formula is deduced which represents the time required by the generator to build up in relation to the electrical constants of the field circuits, residual magnetism and the saturation effect. The time lag increases with the resistance of the field circuit up to a certain point, beyond which it decreases. Theoretical studies of the problem are compared with experimental data, and it is found that with no residual magnetism the time lag is much larger than that theoretically calculated.—*Journal of Institute of Electrical Engineers of Japan*, September-October, 1923.

Transmission, Substations and Distribution

Rotary-Converter Transformers.—G. BERG.—A discussion of the methods for regulating transformer voltage used to energize rotary converters. Voltage regulation may be secured by field regulation with series reactance, a synchronous alternating-current booster, induction regulator, extra taps on the transformer, and by regulating or split poles. Most of the article is taken up with a theoretical discussion of sandwich windings where the high-tension winding is placed between the two halves of low-tension winding.—*Electrician (England)*, Nov. 16, 1923.

Units, Measurements and Instruments

Power Losses in Insulating Materials. —E. T. HOCH.—It is shown that a satisfactory measure of power loss in a dielectric is the product of phase angle and dielectric constant. Although the dielectric constant need not be explicitly considered in the design of condensers, it is important in such cases as the design of apparatus panels and vacuum-tube bases. The method used in measuring phase angle and dielectric constant is discussed, with the factors affecting power losses and insulating materials and their variations with frequency temperatures.—*Bulletin B-29-1 of the Western Electric Company.*

Accurate Metering.—S. H. RICHARDS.—A close scrutiny of meters and the maintenance of their accuracy leads to a lower cost and smaller charges, producing in turn an increase in the number of customers. Meter accuracy can only be maintained by a frequent and intelligent inspection and test, not only when a meter has been received from the manufacturer, but also at periodic intervals after it has been installed. The article as a whole discusses the standardization work conducted by various countries, electric light associations, insurance companies and other controlling bodies.—*Electrical Review (England)*, Nov. 16, 1923.

Illumination

Lighting of Large Stores.—Several large English stores have recently been rewired and remodeled so that an up-to-date lighting system could be installed. Use of the totally indirect system, even light distribution and absence of glare or shadows, together with excellent illumination from a color point of view, have resulted in a very satisfactory system.—*Electrical Review (England)*, Nov. 9, 1923.

Lighting of Show Windows and Showcases.—This bulletin has been revised to include tests on the effect of intensity and color of light on the drawing power of the show window. Additional information is given on the motor-driven dimmer and circuit changer for show-window work.—*Bulletin L.D. 103-B of the Edison Lamp Works of the General Electric Company.*

Motors and Control

Glass and Electricity.—F. A. CONNOR.—The different processes in making plate glass and the application of electric motors to these processes are described. The plant use as an illustration is the American Plate Glass Company in James City, Pa.—*General Electric Review*, November, 1923.

Polyphase Reaction Synchronous Motors.—J. K. KOSTKO.—The author develops the theory of the reaction motor, shows why its inferiority is mainly due to the faulty form of the rotor, and analyzes the construction, whose performance can be made comparable to that of any standard type of alternating-current motors.—*Journal of A. I. E. E.*, November, 1923.

Device for Testing Electric Fans.—In connection with the work of the Federal Specifications Board the bureau is designing a device for the rapid testing of electric fans. The usual test of the air delivery of electric fans is very unsatisfactory, because it takes considerable time and the results cannot be repeated with accuracy. It is believed that these objections have been overcome in the device now being worked out, the principle of which was tried and found workable some time ago. The present work applies this principle in a more convenient form for field use.—*Technical News Bulletin No. 79 of the Bureau of Standards.*

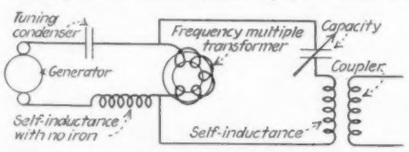
Heat Applications and Material Handling

Acid Electric Steel Castings.—L. J. BARTON.—In the author's opinion, as much skill is required to make good, regular acid steel as is necessary to make metal by the basic processes. It is harder to obtain absolute control of acid metal than of the basic metal. With this idea in mind, this article is written in detail, describing the handling of this process. Cardinal points in good practice, scrap and making bottom, charging and melting down and the making of high carbon and chrome steel are considered.—*Iron Age*, Nov. 8, 1923.

Refractories in the Steel Industry.—J. S. MCDOWELL.—After considering the strength of refractories, hot-load tests, thermal conductivity and resistance to temperature changes for various types of refractory material, the author describes its use throughout the steel industry.—*Blast Furnace and Steel Plant*, November, 1923.

Telegraphy, Telephony, Radio and Signals

High-Frequency Sender for Radio Telegraphy.—K. SCHMIDT.—The author claims that this newly developed frequency-multiplying device, using static transformers, may soon become a serious competitor of the now commonly installed vacuum-tube sender. Modifying the transformer so that its magnetic core was built up of extremely fine iron wires (0.05 mm. in



FREQUENCY-MULTIPLYING APPARATUS FOR COMMUNICATION WORK DEVELOPED IN EUROPE

diameter), it was possible to get as high as the forty-seventh harmonic with 50 per cent efficiency. With a 3.5-kw., 7,600-cycle generator and a multiplier of the above frequency an antenna output of 1.5 kw. and waves as short as 750 m. have been obtained easily with a very good sound, free from secondary noises. It was, however, necessary to provide the driving motor with an extremely sensitive speed regulator. Such a device has been developed which keeps the speed of the motor within 0.0001 per cent between no load and full load. This regulator is based upon the Tirrill principle.—*Elektrotechnische Zeitschrift*, Oct. 4, 1923.

Influence of a Sun Eclipse Upon Radio Receiving.—B. ILIIN.—During the sun eclipse on April 8, 1921, a laboratory near Moscow, Russia, made observations of the intensity of radio signals issued from several stations at distances of 5 km., 760 km. and 830 km. from the receiving antenna. It was found that the incoming signals reached a maximum strength at the moment of maximum eclipse, but that the atmospheric ionization reached at the same instant a minimum. These results are a perfect check on similar tests made on April 17, 1912, by other investigators.—*Jahrbuch der Drahtlosen Telegraphie*, September, 1923.

Technical and Economical Considerations on Commercial Radio Stations.—G. VALLAURI and G. PESSION.—After dealing with the most important problems concerning a radio station the authors give a classification of the stations, considering the kind of service they give. They explain how the different services have to be organized, how they work, the assistance required, the relative expenses, the cost of installation, etc., and what should be done in order to get the best results from all the stations scattered throughout the world.—*Elettrotecnica*, Sept. 25, 1923.

Electrophysics, Electrochemistry and Batteries

The Weight Efficiency of Storage Batteries.—S. MAKIO.—The weight efficiency is defined as the ratio of the total weight of the battery, including electrolyte, in kilograms, to the kilowatt-hour output at a particular discharge rate. Comparison is made of the weight efficiency for several types of batteries, and curves are given for the output of batteries for electric vehicles and for stationary purposes.—*Journal of Institute of Electrical Engineers of Japan*, September-October, 1923.

Electrochemistry of the High-Intensity Arc.—P. R. BASSETT.—Consideration is given to the progressive changes in phenomena of various types of arcs with increasing current. Carbon arcs and ordinary flame arcs change their behavior fundamentally with large currents. The tendency to produce two arc flames, a positive and a negative, is present in an obscure form in practically all arcs. In the high-intensity arc this phenomenon has been enhanced to a point where the two flames are separate and distinct and each flame performs a separate function. The high intrinsic brilliancies obtainable with this type of arc are discussed, and the carbide flame has been suggested as an explanation for the abnormal brilliancies produced.—*Paper presented before the American Electrochemical Society at Dayton, Ohio*, Sept. 27-29, 1923.

Traction

Systems and Methods of Railway Electrification.—H. M. SAYERS.—The decision to electrify a particular railway and the choice of systems and methods can be sound only when based on economic considerations. Approximate estimates of the capital and working costs of electrification and the increase in net receipts to be anticipated are necessary to justify the decision to electrify. The more important factors to be taken into account following the decision to electrify are discussed.—*Electrical Times (England)*, Nov. 15, 1923.

Scientific and Industrial Research

A Department Devoted to Reports of Investigations Contemplated or Completed, Research Facilities Available and Suggestions for Co-operative Work

Conducted by PROF. VLADIMIR KARAPETOFF, *Cornell University, Ithaca, N.Y.*

[PRINTED IN THE THIRD ISSUE OF EACH MONTH]

[When investigations which have been completed are, in the opinion of the editors, of wide enough interest to the field we serve, details thereof will be presented in other parts of this paper. Contemplated research or that which appears to have limited appeal will be only briefly reported in this section, but details may be had by communicating with the investigator or institution named in the report. Readers are referred to the department "Digest of Electrical Literature" for investigations reported in other journals. The news and engineering sections should also be followed for research reported before technical societies.]

Research Completed

Bearings, Overheating of, Relay Protecting

A cylindrical metal bulb fits in a hole drilled in the bearing, and serves as a thermometer at the source of possible trouble. A flexible hose, filled with a volatile fluid, connects this bulb with bellows. Heating of the fluid causes the bellows to expand and to trip a toggle mechanism which opens or closes an electric circuit.—*General Electric Company, Schenectady, N. Y.*

Lamp Filaments, Determination of Life of

It is possible to learn how long a lamp has been burned by placing a section of the filament before a very powerful projector especially developed for this purpose. The image of the filament as thrown on the screen is much enlarged, and every crystal and division is shown. By comparing the size of the filament particles and the condition of the wire itself with the results of tests made on filaments at all stages of lamp life it is possible for the metallurgist examining the filament to determine the approximate number of hours it has been burned.—*Westinghouse Lamp Company,* 165 *Broadway, New York City.*

Meter, Demand, with Synchronous Clock

The type R A demand meter is now equipped with a small synchronous motor designed for high torque and low speed (600 r.p.m. for the 60-cycle motor). The low-speed motor permits the use of spur-gear reduction between the rotor shaft and the worm shaft which is required to convert the horizontal rotation of the rotor to the vertical rotation of the minute shaft of the motor, thus giving a slow-speed worm. This eliminates the necessity of running the motor gearing in oil to prevent excessive wear of the worm gearing. The motor will remain in synchronism from 60 to 200 per cent of rated voltage.—*Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.*

CO_2 Meter on the Wheatstone Bridge Principle

The meter consists of two small identical platinum spirals mounted in gas chambers or cells. One cell is filled with air and sealed, the other is exposed to the flue gas under test. The two spirals form two branches of a Wheatstone bridge. Since the thermal conductivity of carbon dioxide differs from that of air by about 40 per cent, the temperature of the two spirals is different and the bridge is thrown out of balance. The galvanometer can be calibrated directly in percentage of CO_2.—*Brown Instrument Company, Philadelphia.*

Relay for Parallel Transmission Lines

The relay has three operating solenoids. The currents in the two outside (restraining) solenoids are proportional to the currents in the two parallel line conductors; the current in the middle (operating) solenoid is proportional to the difference of the two currents. When because of a line fault the difference in the current in the two lines becomes great enough to overcome the weaker of the two small solenoids, the movable-contact mechanism will rise and throw to one side, thereby completing the circuit of the trip coil of the circuit breaker in the line carrying the greater current.—*General Electric Company, Schenectady, N. Y.*

Steam-Pipe Covering, Efficiency of

Tests have been made on heat losses through steam-pipe coverings, both single and graded, and also on the advantages of jacketing with polished tin. For the data and conclusions see the Bulletin of the State College of Washington, January, 1923, Vol. 5.—*H. J. Dana, Pullman, Wash.*

Timing by Synchronous Motor

A timing mechanism driven by a synchronous motor has proved far superior to a spring-driven clock. It is not sensitive to ordinary changes in temperature, is not affected by vibration, and there are no exposed pivots to rust or spring balance to adjust, nor must they be installed in the level position necessary with a pendulum clock. Failures due to extreme low temperature may be avoided by installing small heating units. These motors are now applied to demand-meter contact-making clocks, portable and station graphic voltmeters, ammeters and wattmeters, time switches, time clocks, flow meters, temperature meters, pressure and water-level indicators, laboratory timing devices, etc. —*Meter Committee of the N. E. L. A.*

In Progress or Purposed

Daylighting from Windows

An experimental study is being made of the daylighting of interiors, upon which actual and detailed quantitative information appears to be meager. The data so far obtained cover actual utilization coefficients for typical daylight illuminations, together with curves and coefficients representing distribution of the daylight under a variety of conditions; also, data on the effect of width of mullions or columns between windows upon distribution of illumination in the room, on the relative effect and efficiency of light from various portions of the window area, on the effect of various methods of controlling the light from windows by means of shades and blinds, and on the effect of dirt accumulations on windows. A paper on the subject was presented at the 1923 convention of the Illuminating Engineers Society.—*H. H. Higbie and G. W. Younglove, University of Michigan, Ann Arbor.*

Ferromagnetic Substances, Correlation Between Mechanical Hardness and Magnetostrictive Effects in

In studying the changes in length due to a magnetic field which occur in steel rods of a definite carbon content, it has been found that different annealing temperatures of a group of rods quenched at 788 deg. C. give different changes in length, depending upon the duration of the annealing process. This analysis reveals definite relations between the magnetic and mechanical characteristics of steel. It is being extended to all sorts and conditions of ferromagnetic substances in the hope that more light may be thrown on the physical meaning of "hardness of metals."—*S. R. Williams, California Institute of Technology, Pasadena.*

Plant Growth, Stimulation of, by Artificial Light

A study of the stimulation of plant growth is being made with a view to commercial application of artificial lighting in horticulture. Tests have proved the feasibility of increasing the growth and development of flowering plants and of those having relatively large leaf area. The increased speed of germination of vegetable seeds has also been demonstrated, when the artificial illumination of an intensity in excess of 500 foot-candles is provided during a fairly large portion of the period of natural darkness. Plants seem to respond better to an intermittent treatment than to a continuous long period of high-intensity illumination. Further studies are being made to isolate the effects of heat from light and to determine possible changes in chemical structure of leaves and stems.—*Westinghouse Lamp Company, New York City.*

Porcelain Glazes, Hardness Test for

A hardness test is being developed for porcelain glazes which consists essentially in wearing away the glaze by means of a standard sand. This sand is allowed to run through an orifice of known dimensions and to strike upon the inclined surface of the specimen after falling a predetermined distance. Satisfactory results are being obtained in comparatively short intervals of time and with small amounts of sand. A circular letter has been sent to a considerable number of potters asking that samples be submitted for testing.—*Bureau of Standards, Washington, D. C.*

Apparatus Available

Machine for Vibration Tests

In many cases a piece of apparatus is intended for severe service conditions where mechanical vibrations determine the life of the device or the quality of its performance. It is therefore of great importance to produce such vibrations artificially in the factory, in order to test newly developed types of apparatus under conditions at least as severe as in actual service. Such a vibration-testing machine has been developed in which the character and the rate of vibration of the part under test can be governed at will.—*Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.*

Suggestions for Research

Dielectric Time Lag

Whether and how far and in what manner the time lag depends upon the configuration and size of the electrodes, the shape of the voltage wave, etc., is still largely unknown, and the entire field, though of high importance, is almost entirely unexplored.—*J. L. R. Hayden and C. P. Steinmetz in A. I. E. E. paper presented at Pacific Coast Convention, October,* 1923.

Generator, Direct Current, Protection of

As the result of tests on motor-generators one manufacturer is convinced that the automatic insertion of resistance in the shunt field of the direct-current generator has been sufficiently developed to protect the machine adequately under any condition of excess current to which the machine may be subjected. Another manufacturer recommends the use of a differential field winding on the direct-current generator as a means for handling excess currents with power flowing in either direction.

Lighting Fixtures, Depreciation in Efficiency Due to Dusting

A forced test for dust collection would be of usefulness in studying changes in design of lighting fixtures, with a view to improvement. However, the simple experiment tried with circulating dust in a closed room by means of electric fans shows that much checking would be necessary before placing full reliance on the results.—*E. A. Anderson and J. M. Ketch, National Lamp Works, Cleveland, Ohio.*

Switchboard Apparatus, Insulation of

Some of the latest European developments in switching apparatus are of interest, especially the use of an insulating compound for protection of the busbars and the corresponding switches, transformers and instruments, and other switchboard devices and arrangements worked out to co-operate with this new system. The advantages over present methods are said to be a great saving in space and greater use of standardized parts. I believe that the advantages of this method of insulation are such that we should push our own development as rapidly as possible.—*E. W. Rice, Jr., Schenectady, N. Y.*

Lamps, Colored, Standard Tints for

There is quite a demand for colored incandescent lamps for display and other purposes, but the number of tints asked for by purchasers is too large and the demand for each color too small to standardize on mass production. An investigation is desired as to the minimum number of really important colors, with the view of standardizing production. It is also of importance to investigate whether it is best to have the color in the lamp bulb itself or to obtain it by means of colored auxiliaries.

News of the Industry

Chronicle of Important Events and General Activities, Announcements and Reports of Association Meetings, Court Decisions and Commission Rulings and News of Electrical Men

Suit Over "Wired Wireless"

General Squier Charges the A. T. & T. Company with Infringement of His Patents

A SUIT has been filed by Major-General George O. Squier, Chief Signal Officer, U. S. A., against the American Telephone & Telegraph Company, claiming infringement of the Squier patents for multiplex telephony and telegraphy. The case was before Judge John C. Knox, United States District Court in New York, last week and this week. Testimony has now been completed. It is expected that briefs will be submitted in January and that Judge Knox will render a decision in March.

The claims of General Squier, as set forth by his counsel, are that his patent, No. 980,356, granted Jan. 3, 1911, is basic in that it is a comprehensive covering of the principle of making possible several telephone conversations over one pair of wires by means of carrier currents of various high frequencies. It is claimed that previous to the time named only one conversation was possible over two wires, that the Squier invention of "scrambling" several conversations at the transmitting end and "unscrambling" at the receiving end extended the usefulness of the telephone wires, and that this principle has been used by the defendant company without payment to General Squier.

Dispute Over Patent Dates

The telephone company in answer claims that multiplex telegraphy was in use long before 1911, that multiplex (phantom) telephony was also in use prior to 1911 (three conversations on four wires), that telephone and telegraph messages were transmitted on the same two wires, and also that prior to 1911 patents had been described embodying essentially the Squier principle. Further, the company contends that since Squier took out his patent under the act of 1883 he dedicated it to the public and that he made public statement to that effect. The company also contends that the invention was unusable and impracticable in 1911 because suitable amplifying equipment and other necessary apparatus were not available. Thus, the company contends, Squier did nothing to advance the art, and furthermore it is maintained that the company is not now using the things specified in what it terms the three fundamental claims.

In rebuttal General Squier's counsel contends that dedication to the public "was to any governmental purposes and no more." Further, General Squier's counsel points out, with regard to the practicability of the invention in 1911, that he had actually had the principle working "over a distance of seven miles of cable, telephone cable, through three telephone exchanges in the city of Washington . . . without the knowledge of the telephone company at all." This is cited as the first instance in the history of the world where multiplex telephony was practiced.

Connecticut Companies Carry Dispute to Commission

Proceeding against the Union Electric Light & Power Company of Farmington, Conn., the Hartford Electric Light Company has petitioned the Connecticut Public Utilities Commission to investigate an unexpired contract between the two companies on the ground that it discriminates in prices against other customers of the Hartford company through the unwillingness of the Union company to agree to an upward revision. The case is of great interest on account of the principles involved and has been heard at length by the board. The contract was signed in 1913 to expire in 1929. An adjustment because of post-war conditions was sought by the Hartford company but denied by the Union company on the ground that the latter would suffer serious loss of industrial power business if forced to increase its rates to offset higher prices for wholesale energy.

At the hearing the Hartford company intimated that the commission, if it finds the present prices discriminatory as compared with other schedules maintained by the Hartford company, should set these aside and order the Hartford company to substitute non-discriminatory rates, not exceeding the prices set forth in its regular schedule of rates on file with the board. The contract with the Union company carried step rates ranging from 4.5 cents down to 1.3 cents per kilowatt-hour, with a 40 per cent discount between 10 p.m. and 7 a.m. In December, 1920, the Hartford company put into effect a power schedule with steps ranging from 7 cents down to 2 cents per kilowatt-hour, the off-peak discount being continued. The Union company purchased 1,737,800 kw.-hr. from Hartford in 1922.

The commission ordered each company to file a brief. The authority of a regulative commission to set aside a contract between public utilities is involved in the case, and findings of the United States Supreme Court are cited.

"Empire Builder" Dies

Sir William Mackenzie of Canada Promoted Light and Power as Well as Railroads

THE death at Toronto on Dec. 5 of Sir William Mackenzie, whose name is inseparably linked with the building of both the Canadian Pacific and the Canadian Northern Railroads, his being the dominating force behind the latter enterprise, removed an outstanding figure in the development of the Dominion and hence of the British Empire. His more spectacular feats in the railroad field somewhat obscured his achievements in other lines of industry, but he was none the less one of the foremost Canadian promoters of electric railway and light and power companies.

As early as 1889 Sir William had become interested in electric railways and in power development, and for thirty years he was the head of the Toronto Street Railway. He became one of the promoters of similar enterprises in South America, now grouped under the head of the Brazilian Light, Power & Traction Company, which estimates its assets at $250,000,000. The holdings of the Brazilian company are the São Paulo Tramway, Light & Power Company, the Rio de Janeiro Tramway, Light & Power Company and the São Paulo Electric Company. Sir William, who was chairman of the board, was associated with Dr. F. S. Pearson, the famous English engineer who went down with the *Lusitania*, in the acquisition of these valuable franchises.

His Widely Scattered Interests

Later Sir William became largely interested in the Winnipeg (Man.) Electric Railway Company, which does a general light and power business, and he was also a director in the Shawinigan Water & Power Company and the Canadian General Electric Company. He was president of the Monterey (Mexico) Railway, Light & Power Company. For many years he was the senior partner of the world-known railroad-building firm of Mackenzie & Mann.

With the changes wrought by the war Sir William was forced, as he grew older, to drop many responsibilities. The Canadian Northern Railroad was ultimately taken over by the Canadian government, the Toronto railway by the city of Toronto, the Electrical Development Company, in the organization of which for the development of Niagara power he took an active part, was acquired by the Ontario Hydro-

Electric Commission, and thus the chief enterprises in Canada with which he had been concerned passed to others and the group of financiers of which Mackenzie was the head was dissolved.

Sir William was born in Kirkfield, Ontario, in 1849. He began life as a country schoolteacher.

News from the National Capital

Division of Public Works Will Be Set Up in Interior Department if Congress Consents—Governor Smith an Obstacle to Superpower Conference—Muscle Shoals and Colorado River

PROSPECTS, according to the Washington correspondent of the ELECTRICAL WORLD, favor the success of the Brown plan for the reorganization of the administrative departments of the federal government in so far as concerns the setting up of a Division of Public Works in the Interior Department and as it pertains to the Department of Commerce.

The main objection to the Division of Public Works comes from the Corps of Engineers of the army. The plan will include, however, provisions to insure the assignment of engineer officers to river and harbor projects and other public construction.

The major changes in the Department of Commerce have been agreed upon unanimously. The President has authority in law to move the technical bureaus in that department. The Attorney-General now is considering whether existing law does not authorize the transfer of all technical bureaus affected by the Brown plan by executive order. It is admitted, however, that legislation will be required to bring about the creation of the Public Works Division of the Interior Department.

So far as the remainder of the proposed reorganization is concerned, there seems little chance of putting it through. Once the heads of departments become wedded to the bureaus under their charge, it is very difficult to reach agreements as to transfers. The remainder of the reorganization plan, it is believed, must await some new administration. If it can be accomplished within the first three months of an administration's course, before it has settled in its tracks, reorganization can proceed smoothly, it is believed.

GOVERNOR SMITH OBSTINATE

Further discussions of superpower plans for the Northeast are being delayed by the Governor of New York. It recently was proposed that the Governor of each state concerned designate a representative to make up a committee to enter upon a study of legal and other questions involved. Despite the fact that the committee's work is entirely one of investigation, intended to throw light on the situation, Governor Smith is understood to be antagonistic to the idea.

An essential to the interconnection is that there be an absolutely free flow of power across state boundaries. While the decision of the Supreme Court in the West Virginia natural-gas case demonstrates that no direct barriers can be set up, it is recognized that the separate states must be in full sympathy with the plan, because otherwise indirect steps could be taken which would interfere with the plan being carried through.

NEW BIDDERS FOR MUSCLE SHOALS

The President's proposal of a joint committee to consider offers for Muscle Shoals is simply an effort to set up an agency which will have authority to negotiate. The regular committees of Congress are not organized with the idea of entering upon such activities.

It is known definitely that there are other bidders besides Henry Ford. This means that there must be intricate negotiations and thorough analyses of each bid. It is believed that the special joint committee idea provides the best means for determining which bid has most value to the public.

It is understood that Mr. Ford is not worried because of the sale of the Gorgas steam plant. He does not seem to be greatly impressed with the need of duplicating that structure at some other point on the Warrior River. The assurance upon which he will insist is that right-of-way for a transmission line be guaranteed by the government. Under the right of eminent domain no difficulty would be presented in furnishing such assurance.

ARIZONA STILL AGAINST COMPACT

No indication has come out of Arizona that ratification of the Colorado River compact is any nearer. The Governor of that state has another year to serve and apparently is willing to continue holding up all development on the entire river and to continue in jeopardy the lives of thousands of persons who are protected inadequately from floods.

New Company to Take Over the United Light & Railways

The United Light & Railways Company of Grand Rapids, Mich., announced on Tuesday in a letter to stockholders that it proposes to sell to a new company, to be known as the United Light & Power Company, the properties of the present company, in order to permit of the enlargement of its business through the raising of new money. The securities of the new concern will be distributed to stockholders of the present company in equitable proportion, according to classes and preferences in due course, the letter states. The new company will be organized under the laws of the State of Maryland.

Falls of Ohio Permit Issued

Goes to Louisville Hydro-Electric—Many Small Projects Acted on by Federal Board

A PRELIMINARY permit covering the development of power at the Falls of the Ohio River was issued by the Federal Power Commission on Dec. 4 to the Louisville Hydro-Electric Company, following the disapproval of a conflicting application from the city of Louisville. In line with this action the commission also denied the application of Louisville for preliminary permits covering proposed developments on the Cumberland and Green Rivers. The decision in this contest had been withheld to permit a thorough consideration of the priorities which are to be allowed municipalities under the water-power act and of the question whether or not municipalities are in a position to conduct the distribution and sale of power in areas out of their jurisdiction.

PROJECTS IN MANY REGIONS

The commission authorized the Pacific Gas & Electric Company to increase the height of its dam on Fordyce Creek, in Nevada County, Cal., by 47 ft., making possible an average increase of 5,500 continuous horsepower.

Preliminary permits were authorized for the Mineral Range Power Company of Columbus, Mont., covering a 1,500-hp. project on Woodbine Creek and Stillwater River; the Southern Idaho Land & Power Company of Weiser, Idaho, covering a diversion of surplus water from the Little Weiser River into the Crane Creek watershed; L. B. Perry of Bishop, Cal., covering a small project on Milner Creek in Mono County, and Ralph Bennett of Los Angeles, covering a 300-hp. project on Rock Creek.

The preliminary permit of the Northwestern Electric Company of Portland, Ore., for a project on the Lewis River was extended until Nov. 6, 1924; the preliminary permit of the Elmore Copper Company of Mountain Home, Idaho, was canceled, and the preliminary permit of the Utah Power & Light Company for its Bear River project was extended three months.

The development on the Rappahannock River at Kelly's Ford, 33 miles above Fredericksburg, proposed by George W. Lucas, was found not to come under the jurisdiction of the commission; but it took jurisdiction in a proposed development of the Public Service Company of Oklahoma involving a 25-ft. dam in the Grand River, of two projects of the Hydro-Electric Company of Harrisburg at Clark's Ferry and Millersburg on the Susquehanna River, and of a project of the Bowersock Mill & Power Company of Lawrence, Kan., to raise its existing dam in the Kansas River.

The Minnesota Utilities Company of Eveleth, Minn., was authorized to transfer to the Minnesota Power & Light Company of Duluth its license covering a transmission line in the Superior National Forest, and the Michigan Hydro-Electric Power Company of

Three Rivers received permission to transfer its license to the Michigan Gas & Electric Company of Ishpeming.

TENNESSEE AND SUSQUEHANNA BASINS

The commission has approved a preliminary permit in favor of Leroy Park of Greenville, Tenn., covering a proposed development on the Nolichucky River, 20 miles above the mouth of Pigeon River. The proposed dam will provide a pool extending as far up the river as the existing dam of the Eastern Tennessee Power Company and is of interest as a further demonstration of the value attached to the power resources of the Tennessee River basin.

A joint application has been received by the commission from the Juniata Power & Water Company and the Watts Power & Water Company of Harrisburg, Pa., for a preliminary permit covering a project in the Juniata River near its mouth. This is the site on which Gannett, Seelye & Carpenter, an engineering firm of Harrisburg, filed about a year ago. The new application proposes the construction of a dam near Losh's Run and the installation of four 2,000-kw. units. The applicants are both affiliated with the East Penn Electric Company, which operates in that region. J. G. White & Company made the engineering investigation.

WYOMING AND FLAMING GORGE

Notice has been served upon the Federal Power Commission that Wyoming would like to be heard before action is taken on the application of the Utah Power & Light Company for a license covering its Flaming Gorge projects. If the Flaming Gorge license is to be issued with a minimum of delay, it would be advisable, judging from similar cases handled by the Federal Power Commission, for the power company and the state authorities to reach an agreement prior to a request that the commission grant the license. This issue does not concern a state in the upstream group and a state in the lower basin, as grouped in the Colorado River compact, but involves two of the upstream states. Nevertheless, it is anticipated that the Federal Power Commission would be inclined to withhold any action until the states concerned could reach an agreement.

John A. Shaffer of Indianapolis has declared his intention to construct an 18-ft. dam in the Wabash River, 6 miles below Logansport, Ind. It seems probable that the Federal Power Commission will not take jurisdiction.

Washington Again Approaches Ottawa re St. Lawrence

Inquiries have again been made by the United States government of Canada as to the possible negotiation of a treaty which would permit construction of a deep waterway from the Great Lakes to the Atlantic by way of the St. Lawrence River. This was admitted at the White House in explanation of the statement made by President Coolidge in his message to Congress concerning "the development of the great power and navigation project of the St. Lawrence River." The project received the President's indorsement.

The White House announcement made no mention of any reply to the new inquiries of the American government, and it is presumed that the Canadian government has not yet forwarded its answer.

Saxton Plant Running

Penn Central Light & Power's New Station on Juniata River Is Formally Opened

FIVE hundred business, industrial and professional men and public officials from all over central Pennsylvania were guests on Dec. 7 of the Penn Central Light & Power Company of Altoona, Pa., at the formal opening of the company's new superpower plant at Saxton, Pa. They were taken to Saxton on a special train. A handsome folder containing airplane views of the plant and the cities in the district it will serve was distributed to the guests.

The Saxton plant, which is on a branch of the Juniata River, is 500 ft. long and 100 ft. wide. It is divided into two units, with a total rating of 12,500 kva., and is operated at a steam pressure of 275 lb. and a temperature of 750 deg. Fahr. The generating voltage is 13,700, which is stepped up to 45,000. The transformers and switching stations are designed to handle 110,000 volts when the plant is running at full capacity. Despite the low stage of the river at this time, the supply of water carried by natural fall to the boilers and condensers is ample to meet all needs. It is the intention of the company to build a dam at Saxton, thus assuring a plentiful stock of water when the plant is operated at full capacity. Automatic control permits the entire plant to be operated by twenty-five men.

Radiating from the plant are four transmission lines, two running to Cresson 25 miles away, and two to Lewistown, 55 miles distant. These lines are carried on 785 steel towers. Two smaller lines carry lighter loads to nearer communities.

Coal is brought from the company's own mine, 3 miles up the mountain. Forty carloads of fuel can be stored at a time, the coal being fed by automatic stokers. The coal is subjected to chemical tests and weighed to the ounce as it is fed to the boilers by automatic stokers, and the fires are maintained at a maximum intensity by forced drafts. The ashes are automatically conveyed outside the plant, special devices crushing the clinkers so that they will pass into the conveyors. One of the interesting features of the plant is the carrier-current telephone system over the transmission lines.

The Saxton plant was designed by Day & Zimmermann of Philadelphia and was put into partial operation several weeks ago.

Hoover Lauds Government's Technicians

Speaking before the Washington Society of Engineers last week, Secretary of Commerce Hoover, after a discussion of the department's efforts to promote steady, as opposed to spasmodic, conditions of employment and to eliminate waste, paid a tribute to the technical men in the government employ.

"The matter of recruiting skill for the government's technical staff is a very serious problem," he said. "In three important technical bureaus a recent analysis shows a turnover of from 30 to 40 per cent per annum. This would indicate to the average executive that his technical staff must be greatly underpaid. I know of no body of men as heroic as those in the scientific employ of the government. The ability of these men and their technical accomplishments make them very attractive to private enterprise. Some of them stay at a sacrifice simply because they believe in public service. It is not fair for any government to require sacrifices such as have been suffered by its technical employees during the last ten years."

New Jersey Public Service's Customer Ownership Plan

On Dec. 1 the Public Service Corporation of New Jersey began another customer ownership campaign for the sale of 100,000 shares of 7 per cent cumulative preferred stock. The stock will be sold entirely by the employees on the basis of not more than twenty shares to one person. A partial-payment plan has been devised for the benefit of those who desire to purchase but cannot pay for the stock outright. The corporation will accept $10 a share as an initial payment and bill the purchaser $10 a month thereafter. The par value per share is $100.

Pit River Transmission Line Raised to 220 Kv.

On Nov. 16 last the Pacific Gas & Electric Company began actual operation of one of its Pit River circuits at 220,000 volts. Although the twin-circuit line was constructed for 220,000-volt operation, it was not actually cut over to this voltage until this time owing to the fact that the line capacity was not needed and because all parts of the second circuit were not ready.

The Pit River development, with its 202-mile, 220-kv. transmission, has attracted much attention in engineering circles because this was the first transmission line to be originally constructed for operation at that voltage. At the present time the second circuit is being operated at 110-kv. in parallel with the 220-kv. line, and this method of operation will be continued until such time as the additional capacity of the second line at 220 kv. is needed. This change will be made when the Pit River No. 3 plant, now under construction, is put in operation during the summer of 1925.

Utilities Commissioners Favor Uniform Accounting Forms

One of the subjects of interest to lighting companies considered at the recent meeting of the National Association of Railway and Utilities Commissioners at Miami, Fla., was a form for the annual report of electric and gas corporations. The committee last year presented its standard classification of accounts in final form, and it reported at Miami that twenty or more states have adopted this classification and that it is pending before several other states. The work of the committee this year was to consider the form and substance of an annual report for electric and gas corporations to be presented for adoption by all states, thereby making for uniform practice.

The report form is to be in two sections, the first a financial section and the second a statistical section. The committee submitted a form for the first section which it felt embraced the minimum requirements of any state commission. The committee has so far been unable to obtain complete unanimity of views on the second or statistical section on account of the diversity of requirements of state commissions and governmental bureaus.

It was recommended that the members of the commissions give careful consideration to the forms prepared for annual reports for electric and gas utilities and adopt them unless they are in conflict with existing statutes and also that the association cause to be copyrighted in its name the forms of the annual reports submitted by its committee.

Priest Rapids May Deliver 200,000 Hp. in 1928

A significant feature of the application of the Washington Irrigation & Development Company for a license covering its Priest Rapids development is the statement in the application that construction work is to start immediately upon the issuance of the license. The first block of 200,000 hp. is to be ready for delivery in four years.

Priest Rapids is on the Columbia River, half way between Spokane and Portland. The Washington Irrigation & Development Company purposes to build a dam 2¼ miles long. The shore ends of the dam are to be of the earthen-wing type. In between will be the power-house section, which in itself will be 660 ft. long. It will provide for a 700-ft. future extension. There is to be a concrete spillway, with a leg extending along an island for five-sixths of a mile. In the spillway sector there are to be 127 gates, each 30 ft. long, with a capacity sufficient to discharge a flood of 1,200,000 cu. ft. per second, or more than five times the flow of the Niagara River. The largest flood of record at this point carried 710,000 cu. ft. per second. Thus a large factor of safety is provided.

A head of 70 ft. will be developed at this dam. Provision is made for two navigation locks and for a fishway. The initial installation will provide six 40,000 kva. and two 29,000-kva. turbogenerators. The ultimate installation will be ten additional 40,000-kva. units, thus providing for a possible future output of 698,000 kva. The initial installation will cost $28,000,000, while the project in its final form is expected to represent an outlay of $41,000,000.

New England Electrical Men Confer on Code

Representatives of all branches of the electrical industry in southern New England held a successful conference on Dec. 5 in the assembly hall of the Hartford Electric Light Company to discuss the meaning of the 1923 Electrical Code. Joseph P. Rohan, chief electrical inspector of the Hartford building department, presided, and Thomas H. Day, Hartford, long identified with electrical fire protection, answered inquiries based upon attendance at the meetings of the electrical committee of the National Fire Protection Association which resulted in the revision of the code in its present form. The meeting was held under the auspices of the Hartford inspection department and of the Western New England Association of Electrical Inspectors.

A. D. Colvin, general manager Hartford Electric Light Company, was chairman of the committee of arrangements, the secretary being O. A. Frederickson.

Federal Budget Asks $385,000 for Bureau of Standards

The budget which just has been submitted to Congress provides $130,000 to enable the Bureau of Standards to co-operate with government departments, engineers and manufacturers in the establishment of standards, methods of testing and inspection of instruments, equipment, tools and electrical and mechanical devices used in the industries and by the government. This includes the practical specification for quality and performance of such devices and the formulation of methods of inspection, laboratory and service tests. The sum will permit of some expansion of this work. The amount appropriated for the current fiscal year was $100,000.

For the investigation of standards of practice and methods of measurements for public utilities, such as electric light, electric power, gas, water, telephone, central-station heating and electric railway service, and the solution of the problems which arise in connection with standards in such service, the budget carries $105,000. This is an increase of $10,000.

For technical investigations in co-operation with industries upon fundamental problems involved in industrial development, with a view to assisting in the permanent establishment of new American industries, the budget carries $180,000. This is an increase of $30,000.

Pacific Coast Jobbers Asked to Support Organized Effort

An unusually interesting program was presented at the regular quarterly meeting of the Pacific Coast Division, Electrical Supply Jobbers' Association, held at Del Monte, Cal., on Dec. 6-8. A plea was made by W. L. Goodwin, operating vice-president of the Society for Electrical Development, for the support of the Pacific Coast in national organized effort in the industry. The Coast represents 10 per cent of the industry's gross sales, Mr. Goodwin said, and should therefore support 10 per cent of national organized effort and take its place in the national scheme. The tendency is for the Coast to decline the services of the rest of the country, he observed, but it might very properly go forward and ask for national aid right now in combating the municipal ownership menace.

W. L. Frost of the Southern California Edison Company spoke to clear up the misapprehension which has been current since his company announced its intention of going into the merchandising business on the first of the year. The company is faced with the problem of building up its gross revenue to the point where it was before the recent rate reduction, which cut its gross receipts $2,500,000 a year. A survey indicates that, on an average, there are now only two appliances to a home, and an attempt will be made to increase this to five. Only the larger load-building appliances will be sold, and there is no intention of selling washing machines or vacuum cleaners. All merchandise will be sold at retail prices and will be purchased through the regular jobbing houses. The company will co-operate with the contractor-dealers, and there should be enough additional wiring to keep them busy. Furthermore, they will benefit from the interest aroused in appliances.

Southern Edison Announces Merchandising Policy

At a recent meeting of contractor-dealers in its territory the Southern California Edison Company of Los Angeles announced that it had finally determined to sell appliances as a load-building policy. In the year 1922 thirty thousand new residence consumers were added to the company's lines. This year, owing to the great activity in home building, about forty thousand new homes have been connected, and it is expected that fully this number will be reached in 1924.

In order to take advantage of the new market thus opened up as well as of the possibilities of increased consumption suggested by the recent rate reductions of the company, the Edison company said that it plans to sell certain popular appliances using 500 watts to 600 watts, retailing them at list prices. The company will also co-operate with the dealers in developing the sale of motor-driven appliances.

Serving Duluth District

Plants Now Operated by Minnesota Power & Light Are Rated at 86,575 Kva.

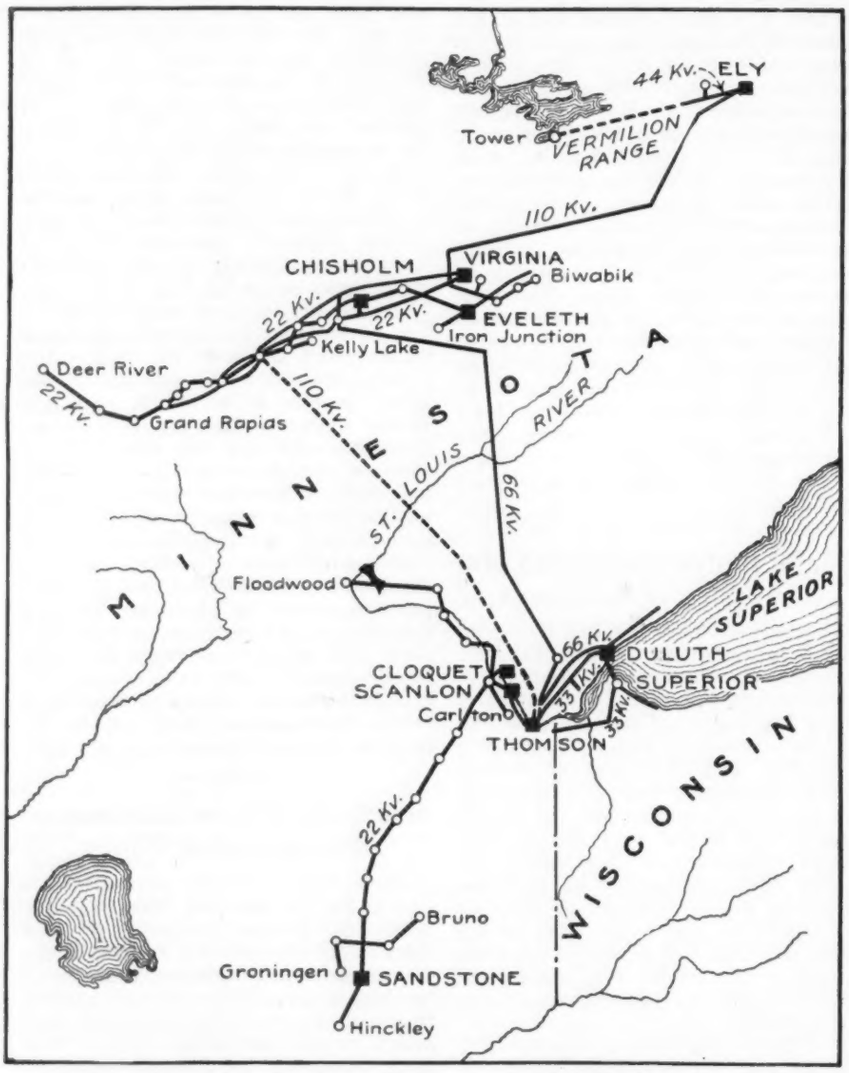
THE newly organized Minnesota Power & Light Company, which is controlled by the Electric Bond & Share Company, owns and operates an important system of electric power and light properties in an extensive territory in eastern and northern Minnesota. It also owns all the capital stock, except directors' shares, of the Great Northern Power Company and operates under lease the properties of that company, including its Duluth system. The electric transmission lines of the company extend north from Duluth to the Mesaba iron range, a distance of approximately 65 miles, and thence east to the Vermilion iron range, a distance of about 50 miles. The transmission system also extends south from Duluth, through Carlton and Pine Counties, a distance of approximately 65 miles. Including Duluth and Superior, forty-four cities and towns are served directly or indirectly—the total population being estimated at 250,000—besides mines and other large power users.

The Minnesota Power & Light Company operates electric generating plants having a total installed generating capacity of 86,575 kva., including 11,000 kva. under construction. Of this total capacity 73,475 kva. is hydro-electric and 13,100 kva. is steam. The proposed capacity of these plants is 121,300 kva. The companies own in fee power sites for the generation of 26,800 kva., which, when developed, will give, together with the proposed capacity of existing plants, a total installed generating capacity of 148,100 kva. The principal generating station operated by the Minnesota Power & Light Company is the Thomson hydro-electric plant on the St. Louis River, which has a present installed generating capacity of 54,000 kva. and a proposed capacity of 68,000 kva. This plant is leased from the Great Northern Power Company.

The Fond du Lac hydro-electric plant, now being built by the Minnesota Power & Light Company, which will have an initial capacity of 11,000 kva. and an ultimate capacity of 22,000 kva., is also on the St. Louis River, immediately below the Thomson plant. At the eastern end of the Vermilion iron range and the northeastern limits of the territory served by the company is the Ely hydro-electric plant. This plant is designed for 10,000-kva. generating capacity, of which 4,000 kva. has recently been completed and placed in operation.

The transmission lines operated by the Minnesota Power & Light Company aggregate 556 miles in length, including 51 miles of 110,000-volt line recently constructed bet veen the Virginia plant and the new Ely hydro-electric plant to serve the eastern portion of the Mesaba iron range, the Vermilion iron range and adjacent territory. There is now under construction a 110,000-volt line, 65 miles in length, extending from the Thomson generating station north to the Mesaba iron range district, which will supplement the line now in operation between these points, and a line 25 miles in length from the Ely station west over a portion of the Vermilion iron range to Tower. Both of these lines will shortly be in operation.

The facilities of the Minnesota Power & Light Company will be steadily enlarged to provide for the rapidly growing power requirements of the territory served. An issue of $8,300,000 of 6 per cent bonds is now being floated to facilitate expansion.



TERRITORY SERVED BY MINNESOTA POWER & LIGHT AND GREAT NORTHERN POWER SYSTEMS, SHOWING EXISTING AND PROJECTED POWER STATIONS

Span of 4,402 Ft. on California Transmission Line

Although figures are not available as to record spans in line construction on wooden structures, the San Diego (Cal.) Consolidated Gas & Electric Company believes a record will be made when a new 11,000-volt line to Alpine which it is building is completed. On this extension will be erected two spans which will surpass the previous record made by that company.

The Alpine transmission line will have one span of 4,402 ft., followed immediately by another of 3,397 ft., both of which will exceed the 3,069-ft. Mission Valley span. The engineers of the company at first hoped to combine the two spans in one of nearly 8,000 ft., but contour conditions prevented the carrying out of this plan.

The two long spans will be pulled on three-pole structures to a tension estimated at 9,000 lb. Extra-galvanized special-high-strength $\frac{7}{16}$-in. steel-strand cable will be used. A difference of elevation of 108 ft. exists between the structures at each end of the first span.

Exceedingly difficult line construction conditions have been resourcefully met by the crews of the San Diego Consolidated Gas & Electric Company. An air compressor mounted on a special truck was driven over untracked brush country to within 900 ft. of the center structures of the long spans and air under pressure was piped to the crews digging the pole holes. In solid rock the pneumatic drills aided materially in the speed of sinking pole and anchor holes.

Federal Bureaus Report

Work on Electrical Statistics by Census Bureau—Standards Bureau's Aid to Electrical Art

EXPANSION of foreign trade, the greatly improved statistical service now rendered, progress in the elimination of waste, conferences with commercial and industrial committees, fuel distribution and many other activities are dwelt upon in the annual report of the Department of Commerce, just transmitted to Congress. Needed legislation is outlined.

Secretary Hoover's recommendations concerning the radio situation were noticed in the ELECTRICAL WORLD last week. Under the head of "Electrical Industries" the included report of the Bureau of the Census says:

The canvass for the collection of data concerning the operations of central electric light and power stations, electric railways, telephones and telegraphs was started promptly with the beginning of the calendar year 1923. The field work was practically finished by the close of the fiscal year, and we hope to publish the results before Jan. 1, 1924, thus making another record in the completion of a big investigation. Peculiar importance is attached to this inquiry, as the results will be used at the World Power Conference to be held in London, England, during next July. The figures will show the increase during the last five years in the use of electricity in the United States for light, power and other purposes.

It is regretted that the appropriations for this inquiry have never been sufficient to enable the bureau to collect data concerning the operations of isolated light and power stations. While the isolated stations are not engaged in the production of electricity for sale, and are operated primarily for the benefit of the activity with which they are connected, such as hotels, factories, mines, mercantile establishments, vessels, private residences, etc., many of them are very large and have a much greater kilowatt capacity than many of the central stations that are covered by the census. There are undoubtedly a greater number of these isolated plants than there are commercial stations, and their inclusion in the census would add greatly to the value of the statistics.

ELECTRICAL STANDARDIZATION

Another included report is that of the Bureau of Standards, which says, under the caption "Electricity":

Particular attention has been paid during the past year to the revival of fundamental investigations, such as the fundamental measurements of resistance, the ratio of the international to the absolute henry and the use of the absolute electrometer for high voltages.

The importance of the electrical work of the bureau in the industries is well illustrated by the lamp inspections, through which the government's purchases of incandescent electric lamps are controlled, and the investigation and testing work on electric batteries, of which a large amount is now being carried on. Although the government's purchases of electric lamps were smaller than usual this year, no less than 1,706 lamps, representing orders totaling 1,660,000, were subjected to life tests.

Radio communication is assuming a place of the first importance in the electrical field, and naturally a large part of the time of the division has been devoted to radio subjects. The bureau is endeavoring to aid in the commercial standardization of radio equipment, a progressive step of great importance and for which an excellent opportunity exists in this field owing to the newness of the entire subject. Progress has been made in the development of precise frequency measurements and other investigations connected with the reduction of radio interference. The work on electron tubes and insulating materials will have a most important industrial application.

The mitigation of electrolytic corrosion is a serious question in many localities, and the work which has been carried out, and which includes not only actual field surveys but also the development of an improved earth-current meter, is of very great importance.

In connection with safety codes, important progress has been made in preparation of new editions of the National Electrical Safety Code.

A revision of the bureau's circular on electric service standards has been taken up, and a complete survey of electric lighting conditions throughout the entire country, with the ultimate object of standardizing equipment of this kind, is now well advanced.

Brief News Notes

An Old Friend Reappears.—Among the flood of resolutions introduced into the House as the new Congress met was one by Representative Browne of Wisconsin asking for a commission to select an electromechanical voting system for quickly recording the votes of members, at a cost not to exceed $300 per member. The resolution carried an appropriation of $130,500.

Two Newfoundland Companies Are Merged.—The Newfoundland Light & Power Company has been purchased by the United Towns' Electric Company, Ltd., of Carbonear, Newfoundland, of which J. J. Murphy of St. Johns, Newfoundland is president. The United Towns company has a hydro-electric plant at Victoria Village and already lights twenty-seven villages on the island.

Oklahoma Express Company Purchases Electric Trucks.—The American Express Company of Oklahoma City intends to replace all its horse-drawn transportation in that city with electric trucks. New trucks valued at $100,000 have been purchased for immediate delivery and the construction of a battery-charging station is under way. The Oklahoma Gas & Electric Company will furnish electrical energy. Oklahoma City will be the first city west of the Mississippi River where the express company will have electric equipment exclusively.

To Celebrate Anniversary of Henry's Birth.—The one hundred and twenty-fourth anniversary of the birth of Joseph Henry is to be celebrated by radio on Monday next, Dec. 17. Brief addresses sketching his career will be broadcasted from Schenectady and Troy, N. Y., and the ringing of the small bell, now in the New York State Museum at Albany, which Henry used in his electromagnetic and telegraphic experiments will be heard by listeners to the programs from the stations named.

Southern Sierras to Purchase Holton Power Company—The Holton Power Company, supplying light and power in the Imperial Valley of California, has applied to the California Railroad Commission for permission to sell its properties to the Southern Sierras Power Company. It is proposed by the terms of purchase that the latter company shall pay $2,286,124 for the business, properties and assets of the Holton Power Company, with the exception of its ice-manufacturing property.

New Alaskan Cable to Transmit a Hundred Words a Minute.—Laying of the new 1,800-mile Alaskan cable will be begun by the middle of April and finished before the end of next summer. The successful bidder for the cable was the firm of Siemens Brothers & Company of London, whose bid was $1,250,000. The new cable will permit the transmission of one hundred words per minute. This is five times the capacity of the existing cable. The cable is designed to last one hundred years. No submarine cable is manufactured in the United States, it is explained, for the reason that the essential guttapercha is controlled entirely by European manufacturers.

Staley Electric Railway Project Disapproved by I. C. C.—The Staley System of Electrified Railways has been denied authority by the Interstate Commerce Commission to construct 1,307 miles of electrified railroad in southern California, Arizona, New Mexico, Colorado and Utah. Sixty-six miles would be in Mexico. The estimated cost of constructing the entire 1,307 miles was $76,024,236, including $6,000,000 for terminals on the Gulf of California. The applicant's estimate of traffic and revenue for the first year of operation was 2,274,732,417 ton-miles of freight and $45,087,550 of freight revenue. The commission regarded the estimates of revenues as excessive and held that there was no public necessity for the proposed line.

Southern Sierras and San Diego Companies Interconnect.—The Nevada-California Electric Corporation has placed in service a system whereby its subsidiary, the Southern Sierras Power Company, will maintain an interchange of electric power with the San Diego Consolidated Gas & Electric Company, safeguarding both interests against interrupted service. The transmission line over which the interchange of power will be carried extends from the Nevada-California's southern distributing station at El Centro to San Diego, a distance of 80 miles. Heretofore the Nevada-California's nearest source of electrical energy to El Centro and the Imperial Valley was the company's steam generating plant at San Bernardino, a distance of 175 miles.

Growth of Community Power & Light Company.—The Community Power & Light Company, a holding concern which, through its subsidiaries, serves thirty-one communities in Missouri, Kansas, Arkansas and Texas having a population in excess of 100,000, is floating bonds in order partly to finance acquisition of the Central Texas Ice, Light & Water Company, serving seven communities in or adjoining Limestone

County, Tex., and the Central Texas Ice & Light Company, serving seven communities in or adjoining Falls County, Tex., together with an ice plant at Helena, Ark., and substantial plant and transmission-line extensions in Kansas, Texas and Arkansas.

Contest for High-School Essays on Utility Regulation. — The Northwest Electric Light and Power Association has announced a scholarship prize, to be competed for by seniors in the high schools of the state and to be awarded each year for the best essay on the topic "State Regulation of Public Utilities." The prize will be a four-year university course in any of the public or accredited private institutions of higher learning in the state and will be in the sum of $250 a year.

Washington Superpower League Organized.—At a meeting of public ownership advocates in Tacoma recently an organization was effected under the name of the Washington Superpower League and adopted plans for a statewide campaign to pass at the November election next year a state initiative bill giving municipalities and larger districts authority to operate public power plants. The meeting approved the general principles of the power bill drafted by Councilman Oliver T. Erickson of Seattle, designed, its promoters say, to conserve the water power of the state while promoting public development of hydro-electric plants. It was agreed, however, to omit from this bill the provisions authorizing public operation of telephone systems by municipalities or larger public units.

Progress in Honolulu.—Plans for the expenditure of $1,250,000 for improvements to its power plant and transmission system have just been approved by the board of directors of the Hawaiian Electric Company of Honolulu. This proposed expenditure is exclusive of $500,000 for the erection of a new office building. The capacity of the power plant is to be increased 35,000 kva. A new 12,500-kva. steam-turbine unit and two additional 826-hp. boilers with modern auxiliaries will be installed, and a reinforced-concrete smokestack, 226 ft. high, will be erected. The company has entered into a three-year contract to furnish power for operating the lines of the Honolulu Rapid Transit Company. New power lines in the sugarcane plantation and other industrial districts of the island of Oahu are to be built. Extensions of the power distribution system in Honolulu alone will cost $150,000. There are now substations at Kaimuki and Manoa. A new one will be built at Waikiki.

Middle West Acquires Wisconsin Properties' Stock.—The Middle West Utility Company has acquired the entire outstanding common capital stock of the United Utilities Company, Lena, Ill. This utility serves twelve communities in the northwestern part of Illinois. It owns all of the bonds and common stock of the Wisconsin Utilities Company, a Wisconsin corporation serving ten communities in south central Wisconsin. The gross earnings of these two companies for 1923 will approximate $300,000. Two transmission lines rated at 33,000 volts are now being constructed from Orfordville, Wis., to Monroe, and from Freeport, Ill., to Lena. When these lines are completed the properties of the Illinois Northern Utilities Compay and those now served by the United Utilities and Wisconsin Utilities companies will be interconnected with the properties owned and operated by subsidiary companies of the Northwest Utilities Company. All the companies involved will thereafter be able to avail themselves of the interchange of hydro-electric and steam power.

Denounces Diversion of Lake Michigan Water.—An animated discussion of the diversion of water from Lake Michigan to the Chicago Drainage Canal took place at the meeting of the Rivers and Harbors Conference held at Washington last week. Mayor C. A. Maguire of Toronto declared that the Sanitary Commission of Chicago was appropriating about 14,000 cu.ft. of water a second to the great injury of Canadian shipping and power developments and in violation of the international treaty. He said he believed the United States government would take drastic action in the matter as soon as the Supreme Court gives its decision in litigation now pending. William G. Bruce of Milwaukee supported the attack, maintaining that the Drainage Canal was being maintained not so much for sanitary as for power purposes. Col. Robert I. Randolph of Chicago and Gardner S. Williams of Ann Arbor, Mich., on behalf of Chicago, claimed that the health and lives of three million people depended upon the continued operation of the Drainage Canal. They said the slight diminution in the lake levels was negligible and that Chicago is ready to restore the levels by erecting at her own expense dams and weirs in the St. Clair and Niagara Rivers.

Institute Prizes Awarded.—The two prizes established by the board of directors of the A. I. E. E. in 1921, each consisting of $100 in cash and a suitable certificate, have been awarded for the current year by the committee in charge as follows: The prize for the best paper on transmission to R. J. C. Wood for his treatise on "The 220-Kv. Transmission System of the Southern California Edison Company and Some 220-Kv. Researches"; the "first-paper prize," for the best paper by a member who has never before presented a paper at a meeting of the Institute or any of its sections, to C. H. Van Asperen for his treatise on "Mechanical Forces on Busbars Under Short-Circuit Conditions." Honorable mention in the transmission prize award went to H. B. Dwight for his paper on "Electric Characteristics of Transmission Lines," and in the first-paper prize award to E. B. Shand for his paper on "An Analytical Investigation of the Causes of Flashing of Synchronous Converters." The prizes will probably be presented at the Philadelphia meeting of the Institute in February.

Associations and Societies

Tennessee Association of Electragists.—This body has elected these officers: President, D. L. Nicholson, Nashville; first vice-president, C. E. Terrell, Chattanooga; second vice-president, J. G. Cason, Knoxville; third vice-president, R. L. Clift, Memphis; secretary and treasurer, J. A. Fowler, Memphis.

Providence Engineers to Hear History of Electric Light.—Before the monthly meeting of the Providence Engineering Society on Dec. 18, Henry Schroeder, engineer Edison Lamp Works of General Electric Company, Harrison, N. J., and author of the "History of Electric Light," published by the Smithsonian Institution, will speak on the "Historical Developments of the Incandescent Electric Lamp."

Coming Section Meetings of the A. I. E. E.—Meetings of Institute sections for next week are announced as follows: Syracuse, Dec. 17, "Electrical Development in Retrospect," Paul M. Lincoln; New York, Dec. 19, "Human Engineering," Prof. Franklin H. Giddings; Worcester, Dec. 20, "Industrial Control and Applications Thereof," William C. Gates. In Pittsburgh on Jan. 15 Noble Jones, general manager of the West Leechburg Steel Company, will describe the recent electrification of that company's works.

Coming Meetings of Electrical and Other Technical Societies

[A complete directory of electrical associations is published in the first issue of each volume. See July 7 issue, page 56, for latest list.]

American Physical Society—University of Cincinnati, Cincinnati, Dec. 27-29. H. W. Webb, Columbia University, New York City.

American Engineering Council (F. A. E. S.)—Washington, Jan. 10-11. L. W. Wallace, 26 Jackson Place, Washington.

Kentucky Association of Public Utilities—Seelbach Hotel, Louisville, Jan. 10-11. E. F. Kelly, Louisville Railway Company.

Wisconsin State Association of Electrical Contractors and Dealers—Pfister Hotel, Milwaukee, Jan. 17-19. H. M. Northrup, 23 Erie Street, Milwaukee.

Technical National Section, N. E. L. A.—Birmingham, Jan. 28-Feb. 1.

Western Association of Electrical Inspectors—Hotel Fontenelle, Omaha, Jan. 29-31. W. S. Boyd, 175 West Jackson Blvd., Chicago.

American Institute of Electrical Engineers—Midwinter convention, Bellevue-Stratford Hotel, Philadelphia, Feb. 4-8. F. L. Hutchinson, 33 West 39th St., New York.

Commercial National Section, N. E. L. A.—St. Louis, Feb. 27-28.

Recent Court Decisions

Workman Who Falls on Wire of Which He Knows the Existence and Danger Is Negligent.—In Bouchon vs. New Orleans Railway & Light Company a widow sued for damages because of the death of her husband, a painter who was killed when he fell across a heavily charged electric wire belonging to the company which stretched across a roof on which he was working. Evidence showed that the decedent knew of the existence of the wire and of its dangerous nature, and that he had replied to a shouted warning, "Damn the wire!" The Supreme Court of Louisiana therefore held that contributory negligence was clearly established and sustained the trial jury in finding for the company. (97 So. 587.)*

Orders of North Dakota Commission Reviewable as to Law and Facts.—In a rehearing, at the instance of the state, of the case originally brought by the Hughes Electric Company of Bismarck against the Board of Railroad Commissioners of North Dakota (ELECTRICAL WORLD, Sept. 15, page 561), the Supreme Court of that state reaffirmed the constitutionality of the public utilities act, declaring it not void as vesting legislative or judicial powers in administrative officers and holding that it did provide for a judicial review of both law and facts. In its finding the court defined the word "hearing" as meaning not only the privilege to be present when a matter is being considered, but the right to present contentions and to support them by proof and argument. (195 N. W. 292.)

Wholesaler of Electrical Energy Is Public Utility.—An electric power company which wholesales its product is a public utility and, under the terms of the statute, must furnish monthly reports covering its operations according to the finding of the Supreme Court of Oklahoma in Southern Oklahoma Power Company vs. Corporation Commission. The power company had declined to make monthly reports as directed by the commission, asserting that it was not a public utility inasmuch as it did not distribute its output, but furnished energy to other companies for distribution to consumers. In its decision upholding the commission the Supreme Court said: "The statute does not require that the corporation furnish the commodity to the public, but if it furnishes a commodity for the purpose of that commodity being delivered to the public for the production of heat, light or power, it comes within the statute defined in the order of the commission."

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

"Public Necessity" Defined. — Sustaining a decision of the Illinois Commerce Commission which was contested by the Wabash, Chester & Western Railway Company, the Supreme Court of Illinois said that a court was not authorized to put itself in the place of the commission, try a question anew and substitute its judgment for that of the commission, which could be set aside only if arbitrary, unreasonable or in clear violation of law. The court further observed that when the statute requires a certificate of public convenience and necessity as a prerequisite to the construction of a public utility the word "necessity" is not used in its lexicographical sense of "indispensably requisite," but that any improvement which is highly important to the public convenience and desirable for the public welfare may be regarded as necessary. "If it is of sufficient importance to warrant the expense of making it, it is a public necessity." (141 N. E. 212.)

Commission Rulings

Company's Rates in One State Not Conclusive for Another.—Declining to allow the Indiana & Michigan Electric Company an increased minimum charge for electric cooking and heating, the Michigan Public Utilities Commission said enough evidence had not been produced to warrant the change and that it could not be approved merely upon the ground that such a minimum charge was applied in territory served by the utility in Indiana.

Service Extension Into Occupied Town Permitted.—The Bangor (Me.) Railway & Electric Company has been authorized by the Maine Public Utilities Commission to extend its service from Orrington to North Bucksport. The Central Maine Power Company already supplies electricity to the Bucksport section of the municipality, but declared to the commission that it does not desire to extend its service further in the town. The commission finds that public convenience and necessity require that a second public utility be authorized to furnish service in the locality.

Bonuses and Royalties Paid by Utility Company to City Are Disapproved.—In determining rates for the Helena Light & Railroad Company, which operates electric light and power, electric railway and gas departments, the Montana Public Service Commission ordered to the extent of its jurisdiction in the premises the relief of the company from the payment of bonuses or royalties to the city of Helena. The commission said: "With respect to the request for relief from the payment of bonuses or royalties to the city, accrued and to accrue, we have long held the opinion that these bonuses exacted an unlawful discrimination in rates from the patrons of the three utilities. It is true that the patrons of any public utility are charged rates constructed to include the company's taxes, but the bonuses and royalties prescribed in the several franchises of this company can hardly be said to be taxes, and even if so, they are taxes above and beyond the ordinary city, county, state and federal taxes, which the company pays in addition to these franchise bonuses. To their extent they simply increase the burden which the patrons of the utilities bear. As far as the street-railway and gas franchises are concerned, the bonuses cannot be said to rest on any sound principle, for those two franchises do not return the company a profit, but on the contrary entail a direct loss in performance of the franchise obligations. These bonuses provide a method whereby the city reaches into car riders' and gas and electric patrons' pockets to secure revenues in addition to the revenues collected by ordinary taxes. These relatively small groups are bearing a double burden."

Competition Between Public Utilities Undesirable.—In refusing to permit the operation of motor vehicles in competition with the street railway of Portland, the Maine Public Utilities Commission said: "Competition, which brings life and force and incentive to ordinary industry, cannot truthfully be said to be invariably desirable in the conduct of public utilities, which in their nature, although owned by private individuals, are dedicated to the use of all the citizens of the community and governed in many ways by the state itself. Public utilities must of necessity be limited in number in any given community in order to attract capital for maintenance and development. There may be exigencies when competition must be the exception to the rule, for industry must not wither by the slothful enterprise of existing utilities."

Inspection of Changes in Wiring of Plants.—A complaint alleging discrimination was made against the Commonwealth Edison Company by one Tegtmeier, who complained that six months' permits were issued to licensed electricians employed at various factories and other places, these licenses giving to such concerns the right to make alterations and receive service through meters theretofore installed, pending an inspection by the Chicago electrical department. The complainant asked that either this practice be discontinued or that energy be furnished by the company at any or all places where the complainant might install electric wiring without a city license or inspection. The Illinois Commerce Commission said that it was clear that some rule should be in vogue which would permit industries using electrical energy to make a change in wiring without first obtaining a permit, otherwise industries would often have temporarily to shut down.

Men of the Industry

Changes in Personnel
Accomplishments, Responsibilities, Honors, Appointments and Activities of Men Engaged in all Branches of the Electrical Industry

H. G. Taylor Elected President of Utilities Commissioners

Henry G. Taylor, chairman of the Nebraska State Railway Commission, was elected president of the National Association of Railway and Utilities Commissioners at the convention held last week in Miami, Fla. Mr. Taylor was elected a member of the Nebraska State Railway Commission in 1913 and has been associated with the commission continuously since that time, having been made chairman in January, 1920.

Throughout his entire membership he has been very active in commission work and in promoting the interests of the national association which he has just been elected to head. Mr. Taylor is a native of Nebraska, but spent his boyhood in Kansas. For a time he engaged in the newspaper business in Almena, Kan., and subsequently became the owner and publisher of the *Central City Nonpareil* at Central City, Neb. He spent approximately twelve years in the publication of this newspaper and during this time served as representative from Merrick County, Neb., in the 1911 Legislature. At the present time Mr. Taylor is general chairman of the Central Western regional advisory board of the American Railway Association.

D. H. Beardsley has been made district superintendent of the Consumers' Power Company at Alma, Mich., succeeding Paul T. Woodworth.

Paul T. Woodworth, who has been district superintendent of the Consumers' Power Company at Alma, Mich., for the past five months, has been transferred to Grand Rapids.

L. P. Sweatt, Jr., formerly district manager of the Alabama Power Company at Montgomery, has been appointed manager of the southern division to succeed Mr. Barry, with headquarters at Montgomery.

B. F. Bramble, for many years auditor of the Illinois Traction System, has been appointed comptroller of the North American Light & Power Company, according to an announcement made by William A. Baehr, president of the company. Mr. Bramble will divide his time between the Chicago and Champaign offices of the North American company.

Henry E. Rilling, for many years connected with the security and advertising departments of the Wisconsin Power, Light & Heat Company at Madison, has given up that post to become associated with the Eastern Wisconsin Electric Company at Sheboygan. Mr. Rilling will immediately be placed in complete charge of customer ownership sales and advertising promotional work.

Charles McKinley Saltzman, New Chief Signal Officer, U. S. A.

Col. Charles McKinley Saltzman, who has been named to succeed Major-General Squier as Chief Signal Officer of the army, as was announced in the Dec. 8 issue of the ELECTRICAL WORLD, was graduated from West Point in 1896 and was assigned to the First United States Cavalry. After service in the Spanish-American War he was appointed captain in the Signal Corps in 1901, and later in the Philippines he was assigned to duty as signal officer on the staff of Major-General Wood, commanding the Department of Mindanao, where he had charge of the maintenance of all land and ocean cable lines.

C. McK. SALTZMAN

When he returned to the United States in 1905 Major Saltzman was assigned to the United States Army Signal School at Fort Leavenworth as senior instructor and had charge of the electrical instruction of officers. From 1908 to 1913 he was in charge of the electrical division of the Signal Corps in the War Department at Washington, with supervision over the design of radio and other electrical equipment used by the Signal Corps and in the fire control systems of the Coast Artillery.

In 1915 Colonel Saltzman was sent to Panama as the army signal officer and had general charge of the installation of the radio, telegraph and telephone systems on the Canal Zone. On the outbreak of the late war he was recalled to Washington and made executive officer in the office of the Chief Signal Officer of the army. In 1919 he was awarded the distinguished-service medal for exceptionally meritorious and conspicuous service.

Newton Jackson, who is at present serving the Newport (R. I.) Electric Corporation in an advisory capacity, has recently become a member of the engineering staff of Sanderson & Porter, New York.

G. Ross Henninger, formerly in the supply engineering department of the Westinghouse Electric & Manufacturing Company, has become protection engineer for the Southern California Edison Company, Los Angeles.

David C. Hopper, for the past four years connected with the Northern Ohio Traction & Light Company as distribution engineer, has resigned to become assistant to the general superintendent of distribution of the Duquesne Light & Power Company, Pittsburgh.

J. N. Helpbringer, who recently resigned the position of general superintendent of power of the Kansas Gas & Electric Company, has been made general superintendent of the Staten Island Edison Corporation, the management of which has been recently acquired by the J. G. White Management Corporation.

Edward B. Hook, Jr., has been made manager of the Atlanta office of Lockwood, Greene & Company, engineers, succeeding Robert Barnwell, who has been transferred to Spartanburg, S. C. Mr. Hook is a native of Georgia and spent four years at the Georgia School of Technology.

E. J. Rosenauer, formerly general auditor of the Southern Colorado Power Company, has resigned to become assistant treasurer and general auditor of the Wisconsin-Minnesota Light & Power Company, with headquarters at Eau Claire. Mr. Rosenauer has been connected with the Byllesby interests for sixteen years.

Walter N. Ballou has been appointed manager of the transportation division of the Atlanta office of the Westinghouse Electric & Manufacturing Company and has charge of the light and heavy traction business of the company in that territory. In addition to handling the street and interurban railway business of the company in Atlanta since 1919, Mr. Ballou has done considerable central-station work.

Prof. Rich D. Whitney, head of the department of electrical engineering at Syracuse University and consulting engineer for the Bureau of Gas and Electricity of the city of Syracuse, was elected chairman of the committee authorized by the recent conference of mayors and other city officials of New York State to study street lighting. Professor Whitney is also chairman of the Syracuse Section of the American Institute of Electrical Engineers.

E. P. Winter is now vice-president of the Midwest Power Company, St. Paul, succeeding Jesse A. Gregg.

F. A. Rothier is now president of the Toledo, Bowling Green & Southern Traction Company, Findlay, Ohio, succeeding William Goepper.

A. S. Coleman, manager of the Alabama Power Company at Gadsden, has been made district manager at Montgomery.

W. Yerby has been made superintendent of district of the municipal water and light department at Wynnewood, Okla., succeeding O. P. Sammons.

B. T. Green has been made engineer of power station of the California Oregon Power Company, at Klamath Falls, Ore., succeeding C. C. Ragan.

H. W. Thomas has been made engineer of power station of the Coast Power Company at Tillamook, Ore., succeeding G. J. Grubb.

E. W. Legier, sales engineer with the American Blower Company, Detroit, has been made district manager of the company at St. Louis.

R. V. Worthing has been made local manager of the Clarion division of the Northern Iowa Gas & Electric Company, succeeding A. C. Jones.

L. B. Fauver, formerly secretary of the Oberlin (Ohio) Gas & Electric Company, has been made president of the company, succeeding Hugo Wurdack. E. G. Crawford is the new secretary.

Ernest B. Millar, formerly associated with the English Electric Company of Australia, is now connected with the Electrical Plant Manufacturers, Ltd., New South Wales, Australia.

Alexander Nyman, formerly engaged in engineering development work for the Westinghouse Electric & Manufacturing Company, has been made director of engineering with the Dublier Condenser & Radio Corporation, New York.

J. Harrison Belknap, formerly assistant professor of electrical engineering at the Oregon State Agricultural College, has joined the control engineering division of the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

Dr. Lee De Forest, inventor of the audion, was the guest of honor at a gathering of the Institute of Radio Engineers held in the Engineering Societies Building, New York, on Wednesday evening, Dec. 12. Dr. De Forest was presented with the Institute honor medal for 1922, awarded him for his invention.

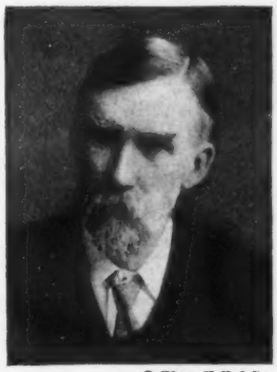
Charles Hearn is now president of the municipal electric light plant at Amherst, Ohio, succeeding Henry Arndi.

R. C. Smith, advertising manager of the *Journal of Electricity*, a McGraw-Hill publication, has resigned to become advertising manager of the Pelton Water Wheel Company, with offices in San Francisco. Mr. Smith has been advertising manager of the *Journal of Electricity* since 1920, when he was transferred to San Francisco from the New York office of the McGraw-Hill Company.

William Porter White has been appointed to act as personal assistant to M. O. Troy, new executive assistant manager of the central-station department of the General Electric Company. Mr. White has been associated with the company since 1906, when he entered the student test course at the Pittsfield works.

Sir Alexander B. W. Kennedy, Consulting Engineer

Sir Alexander B. W. Kennedy, senior partner in the firm of Kennedy & Donkin, consulting engineers, is one of the foremost British engineers of the day. He was born in Stepney in 1847



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SIR A. B. W. KENNEDY

and was educated at the City of London School and the Royal College of Mines. In 1874 he was appointed professor of engineering in University College, London, where he established the first engineering laboratory, and when in 1889 he relinquished the duties of this office to engage in consulting engineering he received from the council of the college the honorary title of emeritus professor of engineering. In 1887 he was elected fellow of the Royal Society, and he received the honorary degree of doctor of laws from the University of Glasgow in 1894. Sir Alexander has designed electric light and power plants in many large cities, including Edinburgh, Manchester and Calcutta, and has served as chief engineer to the Westminster Electric, Central Electric and St. James and Pall Mall Electric Supply Companies and as consulting electrical engineer to the London & North Western and the London & South Western Railways and the London County Council. He is the author of several books on mechanics and kindred subjects and is a past-president of the Institution of Civil Engineers and of the Institution of Mechanical Engineers.

C. W. Thompson is now president of the Athens (Ohio) Electric Company, succeeding P. C. Morris.

G. T. King has been made engineer of power station of the Lancaster (S. C.) Light & Power Company, succeeding G. F. Floyd.

R. R. Knoerr, formerly connected with the generator design department of the General Electric Company at Lynn, Mass., is now engaged in electrical contracting with the firm of Knoerr & Fischer in Milwaukee.

Frank M. Kirby, formerly superintendent and estimator of the Edwards Electrical Construction Company, New York, has become a member of the firm of Kirby-Hellman with offices in New York.

P. E. Matteson, formerly president and general manager of the Tidewater Electric Company, New York, is now sales manager for the Inter-Mountain Electric Company, Salt Lake City, Utah.

Louis H. Hyde, for the past four years associated with the General Electric Company, has become power engineer for the Western Electric Company, Cicero, Ill.

James R. Cravath, formerly Chicago editorial representative for the ELECTRICAL WORLD, is now president of the Pioneer Electric Company, Richmond, Cal. Mr. Cravath is also doing consulting engineering work.

George A. Maher, for many years manager of the Kenosha plant of the C. M. Hall Lamp Company, Detroit, has been elected to the vice-presidency of the company. He will succeed L. T. Buchanan, who has served as vice-president of the company since its organization and who resigned that office a short time ago on account of ill health. Mr. Maher will not leave Kenosha, having arranged his duties so that he can continue his management of the local plant there.

Obituary

Joseph G. Fisher, superintendent of the Sapulpa division of transmission lines for the Oklahoma Gas & Electric Company, was killed on Nov. 25, when he came in contact with lightning arresters at the Kiefer substation. Mr. Fisher was thirty-four years old and had been employed by the company ever since the Drumright plant was purchased seven years ago.

Walter J. Baetje, foreman of the electric meter department of the Oklahoma Gas & Electric Company, died at Oklahoma City on Nov. 17, following an attack of pneumonia. Mr. Baetje joined this organization in 1909, going to Oklahoma City from Mobile, where he had worked for five years on switchboard construction and as an operator. Aside from a short period with the Wagner Electric Company at St. Louis, the Oklahoma organization was the only company with which he had been connected.

Manufacturing and Markets

Devoted to the Discussion of Business and Economic Problems of the Producer and Distributor, with Market Reports, Trade Activities, Foreign and Construction News

The "If" in "Electrify"*

A Frank Appraisal of the Contractor-Dealer—With Some Definite Experience and Suggestions Pointing Out a Way to Strengthen His Usefulness

By O. Fred Rost
President Newark Electrical Supply Company, Newark, N. J.

THE electrical industry has established a most enviable record for rapidity of growth, but the electrical industry does not rest content. The recently inaugurated movement which has as its slogan "Electrify America" is characteristic of this will to win. It is indeed a big order to electrify a continent, and it will require continuous, earnest and strenuous effort in a balanced and co-ordinated program, for the process of electrifying America can go forward only so fast as energy, equipment and energy-consuming appliances are installed.

Since a chain is only as strong as its weakest link and the weakest member of the electrical family is the contractor-dealer, I want to ask you to examine the kind of a foundation upon which this very vital factor in the electrifying movement is built. I have chosen to put the group in the best possible light by confining the study to the membership of its national body, the Association of Electragists International, on the theory that in all probability membership in that association is representative of the best element in the group.

Financial Responsibility

The accompanying map of the United States represents the proportionate financial responsibility of the entire membership of the national association. The smallest area represents that portion of the membership which enjoys the highest credit rating. There are 7½ per cent in that group.

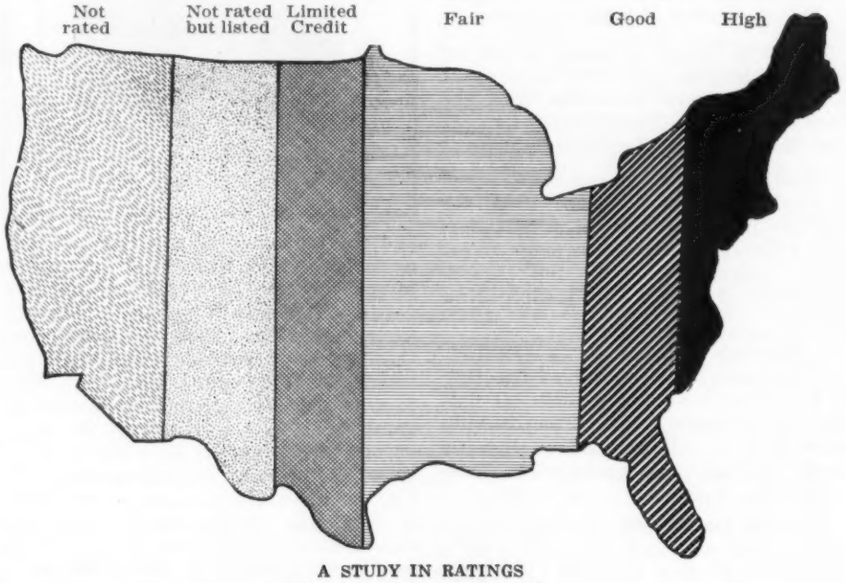
Those with a good credit rating come next, and, expressed in percentages, include 12 per cent. Those two groups, representing a total of 19½ per cent, might be considered that portion of the total membership who in applying for credit would probably pass inspection by the average credit man and to whom credit would be extended.

The next area represents the 34 per cent who have a fair credit rating. Then come 13 per cent who are considered of but limited means; then 15 per cent who are found listed but have a financial standing which warrants neither a capital nor credit rating. Finally 18½ per cent are not found listed at all in the most recent reports of the nationally known mercantile agencies.

Translating these figures brings us to a realization of the fact that of this group, upon which the entire industry depends for the physical labor involved in the electrifying process, only 19½ per cent, or about one-fifth, are what I should like to term in step or in tune with the remainder of the industry, in that they have the financial structure and responsibility to render to the public the class of reliable, dependable and continued service which that public has a right to expect from so great an industry.

Out of the group of 34 per cent with a fair credit rating perhaps 5 per cent will graduate into the higher class, while the rest will either continue merely to make a living or before long disappear. As far as the 46½ per cent is concerned, which is made up of the limited, not rated and not listed groups, any electrical supply jobber can predict just what will happen to them. This study of financial responsibility provides a fair means for appraising the existing condition and the magnitude of the problem which confronts the electrical industry.

The electrical industry may be likened to a four-cylinder engine



A STUDY IN RATINGS
Contractors of the U. S. A.

	Number	Per Cent		Number	Per Cent
High	113	7½	Not rated, but listed	228	15
Good	178	12	Not listed	278	18½
Fair	502	34			
Limited credit	191	13	Total investigated	1,490	100

*An address before the Electrical Supply Jobbers' Association, Buffalo, Nov. 15, 1923.

with the four cylinders representing the central station, the manufacturer, the jobber and the contractor-dealer. At the present time we might say that the contractor-dealer cylinder is missing fire. I need only to remind you of the last time you rode in a Ford car when it was hitting on but three cylinders to give you an excellent illustration of the electrical industry as it is to-day.

The contractor-dealer cylinder will begin firing only when a process of education is used to dispel and clear away the carbon of ignorance and mistrust which at present prevents it from working properly. If that fourth cylinder were made to work properly by the other three branches taking a keener interest in it and making a concerted effort at education, then the dead load which the three branches are now carrying would be lifted and the entire industry would work more smoothly and travel with the throttle wide open on the road to electrification.

I am convinced that you could take any honest man of average intelligence, provide him with a reasonable working capital and the electrical trade papers for his textbook, and that he could speedily obtain enough information and education to enable him to become a contractor-dealer and put his house in order to make a success of his business. In the fact that his house is not in order today we find a most powerful demonstration of the truth that you can lead a horse to water but you cannot make him drink.

Having learned by personal experience through numerous efforts that the contractor-dealer cannot be adequately educated through the press alone for the simple reason that he will not read, I came to the conclusion that if I wanted to build up dealer distribution in the territory covered by our company I should have to do that building up by means of a word-of-mouth process of education and by practical and continual personal contact and co-operation with those who, because of their ability or moral character or both, seemed worthy of the effort.

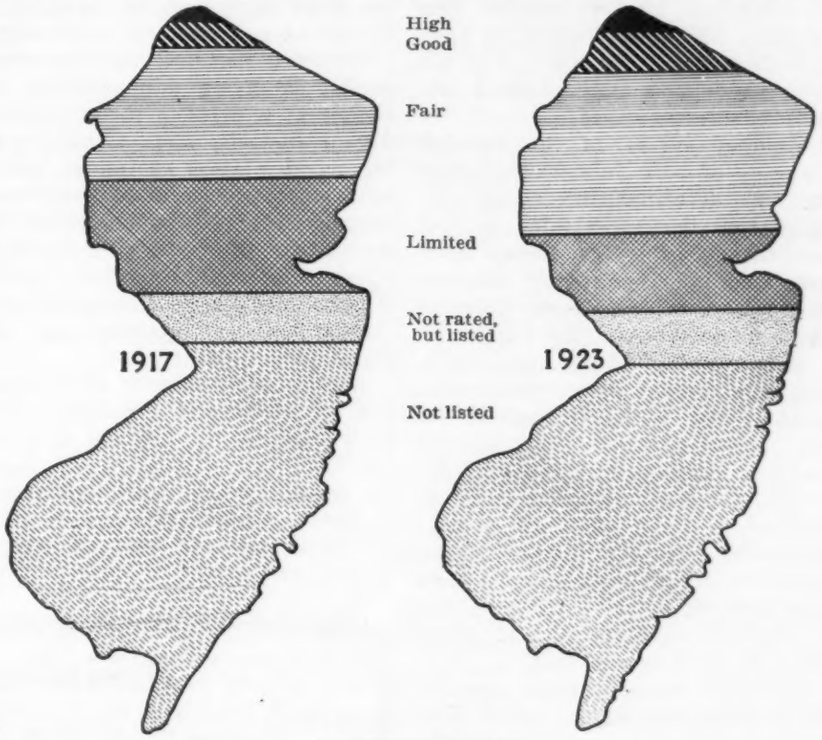
CONDITIONS IN NEW JERSEY

At the time when the program of education by personal contact was inaugurated there were listed in New Jersey altogether 538 contractors. The outline map of New Jersey represents the financial responsibility of those contractors in 1917. Half were in the group of those which were not found listed at all with any mercantile agency. Those 538 contractors installed approximately 17,754 meters, which was an average of thirty-three meters installed per contractor that year. At the time when these statistics were taken there were virtually no electric repair stores in the territory referred to, except about twenty-five branch offices and retail stores maintained by the central-station companies serving that territory.

The first step was the selection of what at one time amounted to a total of thirty-five contractors, to whom we consigned a stock of electrical merchandise. They were selected in their respective localities because they seemed to offer the best, and in many cases the only available material for creating a contractor-dealer in communities or neighborhoods where my personal study made it seem desirable to have a contractor-dealer outlet.

To look after these dealers, help them in fixing up their stores, show them how to trim windows and co-operate in other ways, I selected a young man who was thoroughly familiar with our organization and our way of doing business, and who in addition was willing to learn and had the intelligence to grasp things quickly and follow instructions. He was given to understand that his job was not to make sales and bring in orders, but rather to co-operate with the dealers.

Of the original lot, approximately 25 per cent fell by the wayside. However, in no case did such failure involve a financial loss to us, owing to the close contact which we had with them. Half of the surviving members of our former consignment family today are enjoying a high or good credit rating, and many are discounting their purchases with us. Only two have remained in the group of limited credit risks. Since 1921 we have not consigned any goods, but nevertheless we are continuing to receive a fair share of business from all of those originally served on the consignment basis.



A STUDY IN RATINGS
New Jersey Contractors

	1917	Per Cent	1923	Per Cent
High	3	¾	19	2¾
Good	21	4	39	5¾
Fair	112	20¾	172	25½
Limited	92	17½	74	11
Not rated, but listed	37	7	46	7
Not listed	273	50	324	48
Total	538	100	674	100
Meters installed	17,754		74,265	
Average meters per contractor	33		111.8	

Several contractors were so hard to convince of the advisability of starting a store that for the first four or five months I paid part of their store rent. One of those today is actually worth several thousand dollars and incidentally is one of our very best customers. Another today owns the building he is in. Another recently started a branch in a town 15 miles from his first location. One of those who were induced to open a store is today confining all of his effort to doing a localized small jobbing business.

Another survey of the financial standing of New Jersey contractors in 1923 developed interesting evidence that the work which we had carried on in the New Jersey territory had been sufficiently effective to reflect itself in their financial standing as shown on the map.

This campaign of education which we have carried on embraces estimating, how to figure cost of doing business, basic principles of business management, the importance of proper financing and the wisdom of doing only such volume of business as physical and financial resources permit; helping with store arrangement, dressing windows, use of advertising material and other business-building methods.

The work has cost us an average of 1½ per cent of our total sales volume. But if you can increase the quality of your customers, speed up collection from the contractor-dealers and improve credit risks so that your credit losses grow smaller and smaller, then certainly that expenditure for education can be considered a most excellent investment.

A National Program

To undertake this work on a national scale I believe would require only that individual jobbers should engage in a similar work of education, each in his own territory, and that manufacturers direct part of the vast sums now being spent in printed advertising to further the equipment and organization of the contractor-dealer to do a better job.

There are many ways in which this can be done. There is one manufacturer who already supplies a very useful plate-glass display case if a dealer purchases a certain amount of this manufacturer's material. Why does not some other manufacturer offer a six-foot silent salesman showcase as a premium, or a counter-charge machine, or a set of 100 estimate forms, say, with every standard package of sockets, so that the jobber can pass on those forms to his contractor-dealer customers?

Why could not all the manufacturers of electrical materials agree on some standard line of sectional shelving and cabinets and thereby enable a contractor-dealer to build up his store equipment by purchasing certain lines of material continually?

Why will electrical manufacturers persist in giving a phonograph or bicycle as a prize in their window-display contests, when a cash register or other store equipment would be much more useful to the dealer winning it? Why could not all the manufacturers of electrical material agree on a standard size and type of window background display and get standard display frames into the stores of dealers?

A national schedule of advertising and window-trimming material could be worked out so that one week all the dealers subscribing to this service would have in their windows a background showing a large electric flat iron, the next week perhaps a toaster, and so on.

Let manufacturers also contribute a small percentage of their advertising appropriation to a national fund for the purpose of endowing what might be termed an "Institute of Electragy." This institute might be operated by a neutral body such as the Society for Electrical Development, and it would train men in co-operative work so that after they have finished the course, they would be qualified to help contractor-dealers in behalf of jobbers or manufacturers in any problems that may confront them.

You, no doubt, remember the story in the Good Book where one brother, being asked about the other, replies, "Am I my brother's keeper?" If we want to electrify America, we must lend a helping hand to this brother of ours, who today is crawling alone. We must help to put him on his feet so that he can take his place as a strong unit in the chain and as a full-fledged member of the electrical family, able to work shoulder to shoulder with the rest and play his vital part in carrying out effectively and economically the industry's own command, "Electrify America."

Business Conditions

A Survey of Important Developments in the Electrical Market Including Data on Production, the Sales Outlook, Credits, Exports, the Metals and Other Conditions Affecting Cost, Supply and Demand

ACCORDING to reports received from the leading electrical market centers of the United States, there is an increasing unevenness of conditions as the year end approaches, and the present trend toward quickening of retail distribution and slackening of demand in most primary channels is a familiar occurrence in all commodity lines. Orders in the manufacturing and jobbing houses are largely deferred as attention is diverted to inventory taking, and the fact that increased operations have developed with many electrical manufacturing companies merely illustrates the contrasts which still mark the situation.

Holiday buying, of course, continues to take almost the entire attention of the trade, although there is much activity in the wire, lamp, wiring devices and motor markets. In New England the state of business is described by saying that retail buying is accelerated and is combined with a healthy demand for wiring supplies. In that section buying by distributors is confined chiefly to maintaining a flow of material for immedate uses as inventories among jobbers are being kept low. Buying in New York's holiday market shows great increases, and reports from the retail trade claim that sales are more diversified than ever before. Several large pole orders in the Eastern territory are reported.

Chicago has finishd a prosperous week. Rubber-covered wire advanced last week, and the entire line of code wire went up from 3 to 5 per cent, with No. 14 at $6.50 per 1,000 ft. Lamp sales there are reported as excellent. On the Pacific Coast large sales of rubber-covered wire took place before the expected advance, which was made during the week. No change is reported in Atlanta's business except a price reduction in non-renewable fuses.

Motor Sales Are Far Above 1922; Deliveries Much Improved

ALTHOUGH the decrease in motor business which started in October is continuing, the total volume of sales during the last quarter of the year is considerably above that of 1922, according to several motor manufacturers in different parts of the country. Manufacturers are not viewing the decline with much alarm since they realize that the exceptionally good sales rate during

the spring and summer months could not keep up indefinitely. This condition not only delayed deliveries but imposed serious problems of production and financing upon manufacturers, some of whom possibly had not calculated the requirements for such a rush of business. The present let-up has allowed them to catch their breath and improve their shipments. However, the present volume of business is of such wide diversity that manufactures are reporting increases in sales during the last quarter of 1923 ranging between 50 and 75 per cent higher than during the same period in 1922.

This diversity is spread over producers of pumps, printing, washing and plating machinery, crushers, ventilating fans and manufacturers of motorized equipment. A great majority of sales have been running below 15 hp., while the sizes most in demand are between 2 hp. and 5 hp. The feeling prevailing among manufacturers is that while prices are lower than during the earlier months of the year, their volume of business is very good when considered from a unit basis rather than from a money value.

With this sales decrease manufacturers are in a better position to promise immediate shipments than formerly. Where shipments formerly required several months owing to depleted stocks, most manufacturers are now in a position to promise shipment immediately, or within a few weeks. Accordingly, it might be well for the central stations and the industrial firms to anticipate their motor requirements during the early part of 1924. They can now get much faster shipments than will be possible after the rush has started again next year.

The outlook for 1924 among manufacturers is that a closer holding together of prices will characterize the market. This is because during 1923 most manufacturers ironed out their prices to a fairly constant competitive basis. One company felt that it might expect 25 per cent greater business during 1923 if Secretary Mellon's tax reduction was accepted and if conditions in the industrial field did not again become chaotic. From a price angle few changes are contemplated, although continued advances in both cotton and copper may increase manufacturing costs.

New York's Appliance Market Reports More Diversified Sales

BUYING in New York's holiday electrical market showed great increases last week, and reports from the dealers and department stores say that sales are more diversified this year than ever before. In this respect it is pointed out that the buying public are insisting on more sensible gifts to give their friends and relatives, and this desire is reflected in the electrical market in sales of toasters, percolators, flatirons, washing machines, etc., whereas last year the largest sales were in appliances of a more personal sort, such as warming pads, hair curlers and water heaters.

Meanwhile the wiring supplies and devices market continues at an even clip, with several increases in prices. Sales of rubber-covered wire are not so great as two weeks ago owing to the fact that consumers made large purchases at that time because copper base had advanced, buying great quantities just before rubber-covered was marked up. Lamp sales are increasing daily, the market being up by all kinds of replacement work for both interior and exterior lighting. The motor market continues at a heavy rate, with some improvement in production and lower prices. Several large orders of poles arrived in the Eastern territory last week for consumption by one telephone company and three central stations in extension work.

Fuses Advance, Rubber-Covered Wire Drops in Atlanta Territory

NO PARTICULAR change in electrical jobbing circles has been recorded during the past week, with the exception of a price reduction of 10 per cent on the 250-volt non-renewable cartridge fuse anounced by one jobber and a general price advance of from 2 per cent to 5 per cent on rubber-covered wire. Jobbers state that their business is fine, with a noticeable pick-up in the general supplies line.

With only a few shopping days left before Christmas, holiday buyers are at it in earnest, and electrical retailers report excellent business, particularly in the heating appliance line. During the past year the larger retail dealers in Atlanta have virtually discontinued the portable line, owing to the keen competition of department and furniture stores, but such as do handle portables report a satisfactory business. Contractor-dealers state that their lighting-fixtures business is unusually good for this period of the year, and this can partly be traced to contracts for new schools, a heavy school construction program having been under way in Atlanta for the past year.

Fast-Moving Appliances and Wiring Supplies in Northeast

ACCELERATION in retail trade combined with a healthy demand for wiring supplies characterizes the New England electrical market this week. Buying by distributors is confined chiefly to maintaining a flow of material for immediate uses, and inventories among jobbers are being kept low. All signs point to continued good business in early 1924.

Collections are fair, labor widely employed, and building expansion active, with unusually favorable weather for both inside and outside work. Progress is rapid in generating-plant expansion.

Appliance sales are far above last year's totals. Deliveries are well maintained, but last-minute demands for appliances will be hard to meet. The 1923 Christmas shopping public is closely governed by price considerations, retailers report. Textile manufacturing is improving somewhat, but labor conditions are disturbed in the leather industry. Industrial truck sales are dull.

Large Rubber-Covered Wire Sales Made on Coast Before Advance

BOTH jobbing and retail business in the Pacific Coast territory is good, and with present healthy stocks excellent deliveries are the rule. A summer of rather freakish weather ruined the fan season, and now the electric heater sales are being kept back by unusually warm weather. Country dealers are loaded with unsalable winter merchandise and are buying very sparingly. Large rubber-covered wire sales are reported at the recent advance in price, which had been unmistakably forecast by advances in bare copper. Non-renewable, non-indicating fuses have advanced about 5 per cent, except the 0-amp. to 30-amp., 250-volt sizes, which have decreased from 6 cents to a new price of 5 cents. Cartridge fuse cut-outs have fallen about 10 per cent. A four-carload fiber-conduit order for a power company and a two-carload telephone cable order for railroad dispatching are reported for the week. Of the seasonal lines, Christmas-tree lighting outfits, waffle irons and curling irons are moving exceptionally well.

In Seattle the retail trade during last week showed a tremendous increase in volume, and authorities in the trade predict that the holiday trade this year will eclipse previous records for December. Holiday shopping began early this year, and the increase in volume has been steady. The demand for better quality merchandise is apparent with less criticism of prices. Wholesale trade is reported satisfactory, although buying is for short-time needs and on a conservative basis. Collections are reported good.

Wire Advances in Chicago; Cable Deliveries Slow

THE electrical trade for Chicago, as a whole, experienced a profitable week. This season so far surpasses last year in interest shown and equipment purchased. Rubber-covered wire advanced this week, the entire line of code wire going up from 3 to 5 per cent, with No. 14 now at $6.50 per 1,000 ft., Chicago. Lead is about to advance, it is stated, so higher prices may also be expected on lead-covered cables. Conduit and loom prices remain firm, but there is a persistent rumor that higher levels will be reached soon.

Lamp prices are firm, with no expected change for the first three months of the coming year. Sales are excellent. Christmas-treee lamps are very much in demand, and manufacturers are unable to supply the quantities required as their stocks had been previously contracted for.

Reflector prices are firm, with stocks normal.

The cable situation is not encouraging. One manufacturer states that while sixty-day deliveries are promised for the first two months in the year, his capacity for the rest of this year is sold and no new accounts will be solicited. This is virtually true of most manufacturers. Prices naturally have an upward trend.

High-tension insulator deliveries have eased up somewhat. Deliveries are now being promised in five to six weeks, which is considerably better than those quoted a short period ago. The demand for this class of material has been so exceptionally good that manufacturers have been unable to keep up with it. The demand for low-voltage material has been slow for some time, as evidenced by price variations in this class of merchandise.

The Metal Market

CONSUMERS have been rather anxious to secure copper at 13 cents, delivered, during the last week, and have been freely intimating that they could get all they wanted at that price. So far sales at that level have been confined to a few carloads, although an appreciable tonnage has been sold at 13 cents for delivery in the New York district, where delivery charges are low. A small amount of copper has been sold as high as 13.25 cents, but 13.12½ cents, delivered, represents the bulk of the sales and is a fair average of all the business booked during the week. The volume of sales has not been large either here or abroad. Producers generally are holding at from 13.12½ cents to 13.25 cents.

NEW YORK METAL MARKET PRICES

	Dec. 6, 1923 Cents per Pound	Dec. 12, 1923 Cents per Pound
Copper, electrolytic	13.25	13.25
Lead, Am. S. & R. price	6.85	7.00
Antimony	9.25	9.00
Nickel, ingot	27.00 to 32.00	27.00 to 30.00
Zinc, spot	6.25	6.35
Tin, Straits	43.00	45.00
Aluminum, 98 to 99 per cent	26.00 to 27.00	26.00 to 27.00

The official contract price of lead by the American Smelting & Refining Company was advanced from 6.85 cents to 7 cents, New York, to 7.25. Lead is scarcer than at any time since last February, and some producers are not only completely sold out for December and January but are behind in their deliveries. The zinc market has been inactive all week, although inquiries are many. Smelters are not pressing the metal on the market at present prices.

Activities of the Trade

Devoted to News of the Manufacturer, Jobber, Agent, Contractor and Dealer, Including Important Orders and Contracts for Apparatus and Equipment

Combustion Engineering Joins with Vickers of England

The International Combustion Engineering Corporation, New York City, and Vickers, Ltd., of England, have joined forces in the manufacture of power-plant equipment, according to George E. Learnard, president of the International firm. The arrangements which were completed by Mr. Learnard, who has just returned from abroad, will in no way affect the business which is now being carried on by either company.

Under the plan a new company, to be known as Vickers & International Combustion Engineering, Ltd., will be organized in England with an initial capital of £500,000, owned in equal shares by the two companies interested.

The plant of the new company is situated at Barrow-in-Furness, England, and manufacture will commence there of boilers especially adapted for the burning of coal in pulverized form, superheaters, economizers, pulverizers, dryers, air heaters and all other auxiliary power-plant equipment. The directors of the new company will be Sir Trevor Dawson, deputy chairman and managing director of Vickers; George R. T. Taylor, managing director of Taylor Brothers, Ltd.; George E. Learnard, president of the International Combustion Engineering Corporation, and Wilfred Wood, vice-president of the International firm.

New Battery Equipment Firm

Announcement has been made by the French Battery & Carbon Company, Madison, Wis., manufacturer of electric battery equipment, that its mechanical engineer, Edgar J. McEachron, will in the future be associated with a new organization to manufacture electric battery equipment in Wausau, Wis. He will be in direct charge of the manufacturing and distribution operations of the new company.

Electric Storage Battery Paid $5 a Share in 1923

Declaration of $1 a share by the Electric Storage Battery Company Philadelphia, as a regular dividend for the quarter just ended and an extra dividend of $1 make a total of $5 a share for 1923, which is equivalent to $20 a share on the old stock. Last year, when the recapitalization was put through, common stockholders received four shares of no-par-value stock for each share of old stock. The dividends in 1922 were the equivalent of $16 a share on the old stock. A total of $12 a share was declared in 1921, $11 in 1920, $6.50 in 1919 and $4 in 1918, the last named having been the rate for a long time preceding the more recent era of rapid growth in the business.

Ingersoll-Rand Secures Order for 35,000-Kw. Surface Condenser

The I-R surface condenser has aroused considerable interest in the last few years among engineers and power-plant men. Up to the present time very little information has been published on this condenser except in yearly reports of the N. E. L. A. For this reason the trade will be interested to know that the Ingersoll-Rand Company, 11 Broadway, New York City, has secured an order from the New York Edison Company for a 35,000-kw. surface condenser. This condenser is to be installed under a 35,000-kw. General Electric turbine at Waterside Station No. 1. The condenser is of the standard Ingersoll-Rand external-cooler design with single-pass water circuit.

The auxiliaries included are two Cameron class FV turbine-driven circulating pumps, two Cameron class DV turbine-driven condensate pumps, and two-stage I-R steam-jet vacuum-pump equipment. Ingersoll-Rand surface condensers are now installed or are being built in all the principal sizes from 300 kw. to 35,000 kw.

Canadian Allis-Chalmers Plant May Be Sold to du Ponts

A. E. Dyment of the Canadian Allis-Chalmers Company, Bridgeport, Ont., a subsidiary of the General Electric Company, last week said, regarding reports that the company's shipyard on the Niagara River was to be sold to the du Ponts, that tentative inquiries concerning purchase of the plant had been made, but that no sale had been consummated. Mr. Dyment said he did not know whether the inquiries came from the du Pont interests. The plant has been idle since 1919.

Pelton Company Gets Contract for Pit No. 3 Turbines

The Pacific Gas & Electric Company has awarded the contract for building three 33,000-hp. vertical reaction turbines at its Pit River No. 3 plant to the Pelton Water Wheel Company of San Francisco. These units will operate under a static head of 313 ft. and an average effective head of 280 ft. They will be of materially greater dimensions than any turbines so far installed in the West, the only units comparable with them in horsepower output being for considerably higher heads and therefore handling smaller quantities of water. Each casing will consist of five pieces, each piece weighing 10 tons or more.

The turbines will embody the most recent advances in design developed both by the Pelton Water Wheel Com-

pany and its associate the I. P. Morris Department of the William Cramp & Sons Ship & Engine Building Company.

One of these three turbines will be equipped with Pelton rubber seal rings, and if the test of service shows materially better results than for the other two units, rings will be installed on these as well. Each turbine will have disk-type guide vanes and a spreading draft tube.

The contract includes, besides the main units, the governors, oil-pumping sets and other accessory apparatus, as well as three 108-in. butterfly valves and an impulse wheel for operating a spare exciter set.

Electrical Equipment Exhibits at Lyons Fair, March 3 to 17

The Lyons Fair, one of the most important yearly expositions in Europe, will hold its next meeting in Lyons, France, from March 3 to 17, 1924. American manufacturers, especially those who specialize in electrical labor-saving devices and machinery, are invited to participate. Edouard Herriot, Mayor of Lyons, recently toured this country in behalf of the Lyons Fair and insisted on the urgent need of such machinery in practically every European country.

American manufacturers who cannot spare the time and money to attend the fair themselves are invited to join the all-American demonstration and trade exhibit now being organized by Emile Garden, 50 Church Street, New York City, official delegate of the fair for the United States.

United Electric Appointments in National Sales Force

The United Electric Company, manufacturer of stationary and portable electric cleaners, Canton, Ohio, announces the following developments in its sales force: Harry J. McDevitt, formerly sales manager of the Ohio Electric Company, Inc., New York City, distributor of the cleaners in the metropolitan territory, has become associated with the United Electric sales department. L. D. Gaddis has resigned his position as district sales manager for Colorado, New Mexico and Wyoming for the Eureka Vacuum Cleaner Company to take the position of district manager for Indiana with the United Electric Company.

J. L. Shaw has been appointed district manager for the central Pennsylvania territory. A. O. Engle, formerly branch manager at Toledo for the Stroud-Michael Company, and more recently local manager in that city for the Bissell Company, has been appointed district manager for Colorado, New Mexico and Wyoming. J. E. Foreman has resigned his position with the Electric Vacuum Cleaner Company of Cleveland to become district manager in the Dayton (Ohio) district for the United Electric Company.

New Jobbing House Organized in Denver

A new electrical supply house will shortly make its appearance in Denver, bringing the total of electrical jobbers in that city up to nine. Ernest V. Beck and James W. Ryall, both prominent in the jobbing business for a number of years, are the incorporators of the new company. Beck until recently was manager of the Central Electric Supply Company and previously was associated with the Hendrie & Bolthoff Manufacturing & Supply Company and the Poindexter Supply Company, both in Denver. Ryall will not sever his connections as manager of the electrical department of the Mine & Smelter Supply Company until Jan. 1. He formerly served as purchasing agent of the Western Light & Power Company and was also associated with the Mountain States Machinery Company. A location for the business has already been obtained in the new Barnes Building, 1414 Glenarm Street, but it is believed the store will not be ready for occupancy until the first of the new year. The new company, which was incorporated for $50,000, is to be known as the B. & R. Electrical Supply Company.

Wellman-Seaver-Morgan Engineers to Sell for S. Morgan Smith

Announcement is made that D. J. McCormack, H. E. Popp and H. T. Porter, formerly connected with the hydraulic turbine department of the Wellman - Seaver - Morgan Company, Cleveland, have taken positions on the engineering and sales staff of the S. Morgan Smith Company, York, Pa., builders of water-power equipment.

Mr. McCormack and Mr. Popp are at the main office and works at York, while Mr. Porter becomes manager of the branch office at 76 West Monroe Street, Chicago, filling the vacancy caused by the recent death of John C. Temple. This announcement corrects the impression which has erroneously gained publicity in some of the trade papers that the engineering force of the Wellman-Seaver-Morgan Company was included in the recent transfer of its hydraulic turbine business to the Newport News Shipbuilding Company.

Habirshaw Electric Settles War Contracts Claims

The sum of $379,000 has been recovered for the United States Treasury by the terms of a settlement accomplished by Attorney-General Daugherty with the receivers of the Habirshaw Electric Cable Company, Inc., and the Electric Cable Company of New York City of certain claims and counterclaims growing out of war contracts, according to word received from Washington Wednesday, Dec. 12.

During the war the Habirshaw Electric Cable Company and the Electric Cable Company had contracted with the government for the manufacture of outpost wire and had received advances from the War Credits Board of approximately $914,000. After the armistice contracts were suspended and the companies entered claims against the government for $435,000, leaving an unrecouped balance in favor of the government of about $478,000. The claims board of the War Department was unable to agree with the companies as to the exact amount, and in the meantime the company went into the hands of the receivers. The Department of Justice prepared a suit against the receivers, but before it came up for action a reorganization committee representing the companies offered in compromise and settlement the sum of $379,000, which has been accepted by the Secretary of the Treasury on the recommendation of the Attorney-General.

The American Battery Company, Norfolk, Va., has purchased a tract of 15 acres of land between Norfolk and Ocean View as a site for the erection of a new plant for the manufacture of electric storage batteries, for which bids will soon be asked. It will be equipped for an initial output of about 2,000 batteries per day.

The American Brass Company, Kenosha, Wis., subsidiary of the Anaconda Copper Company, will proceed with plans for the construction of an addition, 220 ft. x 540 ft., one story, to be equipped as a wire-drawing mill. The extension was projected about a year ago and is now being revived. The cost of the work is estimated at $250,000.

The Park Battery Company, Cleveland, has placed a contract for a factory building at 277 East 156th Street, to cost approximately $50,000.

The Walsh Electric Company, 456 Church Street, Toronto, Canada, has purchased a site at 55 Church Street, for manufacturing purposes. The present building will be razed and a new four-story or five-story factory will be erected.

The Killark Electric Manufacturing Company, Easton and Warne Avenues, St. Louis, is presenting to the trade a novel method of merchandising bell-ringing transformers, the feature of which is a display carton of five, with the caption "Simply attach to your light wires and forget your doorbell troubles."

The Tubular Woven Fabric Company, Pawtucket, R. I., has appointed E. C. Johnston, formerly with the Chicago Fuse Manufacturing Company, as district manager of the St. Louis territory, which comprises Missouri, southern Illinois, western Iowa, Kansas, Arkansas, Oklahoma and Texas.

The General Electric Company, Schenectady, N. Y., has plans for two additions to its warks at Bridgeport, Conn., each of one story. One structure will be equipped as a machine-shop extension and the other for general factory service.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number.

An exclusive agency is desired in Gloucester, England (No. 8,403), for incubators of all sizes, etc.

An agency is desired in Buenos Aires, Argentina (No. 8,396), for electrical supplies.

An exclusive agency is desired in Sofia, Bulgaria (No. 8,420), for electric lamps.

Purchase is desired in Celbridge, Ireland (No. 8,448), for wireless apparatus, experimental type.

Purchase is desired in Halifax, Nova Scotia, Canada (No. 8,461), for pulp-wood grinders, four-pocket, wet machines, one 4,000-hp. motor, and machines and tools for machine shop.

Purchase and agency is desired in Bucharest, Rumania (No. 8,409), for insulating material, pipes and fittings, plugs, and precision instruments.

TENDERS FOR HEADWORKS FOR ARAPUNI (NEW ZEALAND) POWER SCHEME.—The date for the receipt of tenders for the Arapuni (New Zealand) power scheme, section 1, headworks, has been extended to April 30, 1924. See Searchlight Section.

PROPOSED HYDRO-ELECTRIC SCHEME IN TRAVANCORE, INDIA.—A conference has recently been held between the Travancore government and the revenue and irrigation members of the Madras government, according to *Commerce Reports*, for the purpose of discussing the adjustment of rights between the two governments in regard to a scheme for using the water of the Kaller River for power purposes. The river has its source in Travancore territory, but the state government wishes to build its electric plant over the state line in British territory.

PROPOSED EXTENSION TO ELECTRIC POWER SYSTEMS IN FRANCE.—The Union d'Electricité is planning to extend its system to supply electricity to the departments of the Seine, Seine-et-Oise and Seine-et-Marne. Eight underground and four overhead transmission lines are to be built, five of which will start from the power station at Gennevilliers and the others from the stations of the Ouest Lumière and the Triphasé companies, which operate under the former company.

New Apparatus and Publications

RECORDING INSTRUMENTS.—The Uehling Instrument Company, Paterson, N. J., has developed a new "Uehling" carbon monoxide (CO) recorder. Bulletin No. 150 issued by the company describes the "Uehling" combined barometer and vacuum recorder for power plants.

HEATER CONTROL AND ELECTRIC RANGE SWITCHES.—The Hart Manufacturing Company, Hartford, Conn., has issued a booklet covering its "Diamond H" heater control and electric range switches.

VOLTAGE REGULATOR.—The General Electric Company, Schenectady, N. Y., has developed a new design single-phase induction voltage regulator.

LACQUER.—A new lacquer, which is waterproof and is furnished transparent or in colors, is being marketed by the Greater Service Company, 329 Broad Street, Newark, N. J.

OIL-TESTING AND POWER-PLANT INSTRUMENTS.—The C. J. Tagliabue Manufacturing Company, 18-88 Thirty-third Street, Brooklyn, N. Y., is distributing catalogs Nos. 699 and 640-A, covering its "Tag" oil-testing instruments for petroleum products and for steam-power-plant instruments, including refrigeration applications, respectively.

TERMINAL SUPPORT FOR RESISTOR UNITS.—A new type terminal for the larger sizes of "Vitrohm" (vitreous-enameled) resistor units has been designed by the Ward Leonard County, Mount Vernon, N. Y.

VALVE.—The A. W. Cash Company, Box 135, Decatur, Ill., is distributing a leaflet covering the "Cash Standard" reducing and regulating valve.

OUTLET BOX.—A new type of outlet box, "Always Vertical," has been placed on the market by the Adapti Company, 2996 East Seventy-second Street, Cleveland.

ELECTRIC GRINDER.—An improved type of grinder has been placed on the market by the Bodine Electric Company, 2254 West Ohio Street, Chicago.

STABILIZER FOR FIRE-EXTINGUISHING SYSTEMS.—A new stabilizer for foam-type fire-extinguishing systems has been developed by the American Dyewood Company, 100 East Forty-second Street, New York City. It is known as "Amdyco" and has been approved by the Underwriters' Laboratories, Inc.

New Incorporations

THE NORTH CENTRAL UTILITIES COMPANY, Minneapolis, Minn., has been chartered with a capital stock of $30,000 by John A. Clark and others. The company proposes to operate electric plants, high-tension transmission lines, etc.

THE CARLETON ELECTRIC COMPANY, Ltd., Woodstock, New Brunswick, Canada, has been incorporated by Heber H. Hatfield, Hartland; Wilmot F. Anderson, Lakeville; Edgar R. Teed, Woodstock; Charles F. Gallaher, Bath, and F. B. Carvell, Ottawa. The company is capitalized at $99,000 and proposes to erect a transmission line from Aroostook Falls to Woodstock.

Construction News

Projects, Plans, Bids and Contracts Contemplated or Under Way

New England States

MALDEN, MASS.—Plans are under consideration for improving the lighting system on the principal streets of the city. The Malden Electric Company furnishes the street-lighting service.

SOMERSET, MASS.—The Montaup Electric Company, Fall River, has applied to the Public Utilities Commission for authority to issue $4,500,000 in capital stock to finance the construction of a superpower plant at Somerset. The total cost of the plant is estimated at $7,000,000.

TAUNTON, MASS.—Bids will be received at the office of Jackson & Moreland, Boston, until Dec. 15 for the construction of the structural work for three substations for the municipal electric light plant as follows: (1) For three steel outdoor substation structures with foundations; (1) two brick and concrete substation buildings; (3) underground conduits. Francis P. Callahan is chairman of commission.

Middle Atlantic States

ANGELICA, N. Y.—The Public Service Commission has authorized the village of Angelica to extend its electric lighting system to the Allegany County Home.

BROOKLYN, N. Y.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Dec. 18 for boiler-feed pumps, electric drills and grinders, etc., for the Navy Supply Depot, South Brooklyn.

BROOKLYN, N. Y.—Bids will be received by William H. Gompert, architect, board of education, Corner of Flatbush Avenue and Concord Street, until Dec. 19, for electric equipment and fire signal systems (fire protection work) in Public Schools 31, 33, 38, 52 and 69, and additions and alterations to electric equipment and fire signal systems (fire protection work) in Public Schools 37, 53, 56 and 74, borough of Brooklyn. For additions and alterations to electric light equipment and fire signal systems (fire protection work) in Public Schools 123, 129, 145, 148, 155, 162 and 168, and fire signal systems (fire protection work) in Public Schools 68 and 88, borough of Brooklyn.

BUFFALO, N. Y.—Electric power equipment will be installed in the flour mill to be erected on the waterfront by the Russell-Miller Milling Company, Minneapolis, Minn., to cost about $750,000.

CATSKILL, N. Y.—The Upper Hudson Electric & Railway Company has applied to the Public Service Commission for permission to extend its electric lighting system into the towns of Jewett and Lexington.

HAMBURG, N. Y.—The Public Service Commission has authorized the Buffalo General Electric Company to extend its electric lighting system into the town of Hamburg.

NEW YORK, N. Y.—Electric power equipment will be installed in the machine and mechanical repair works to be erected by the Department of Plant and Structures, Municipal Building at 278-90 Avenue C, to cost about $3,500,000.

NEW YORK, N. Y.—Bids will be received by William H. Gompert, architect, board of education, corner Flatbush Avenue Extension and Concord Street, Brooklyn, until Dec. 19, for electric equipment in new automobile shop at Murray Hill Vocational School, 237 East Thirty-seventh Street. For additions and alterations to the electric equipment in Public Schools 63 and 65, borough of Manhattan. For installing electric wirings and fittings in new Public School 107, borough of Queens.

PANAMA, N. Y.—The Western New York Electric Company, Jamestown, plans to extend its electric service into the village of Panama.

ROCHESTER, N. Y.—The Rochester Refrigerating Company, 50 Meigs Street, plans to build a new refrigerating plant, to cost about $300,000.

ST. JOHNSVILLE, N. Y.—Preparations are being made by the Adirondack Power & Light Company to build a dam and power house at St. Johnsville.

KEASBEY, N. J.—Arrangements are being made by the Raritan Hollow Tile Company for rebuilding its plant recently destroyed by fire. The work will include a new power house, mechanical drying department and machine room.

TRENTON, N. J.—The City Commission is considering extensions and improvements to the street-lighting system in different parts of the city during the coming year. C. E. Clewell is lighting expert for the city.

ALLENTOWN, PA.—The Pennsylvania Power & Light Company has applied to the Public Service Commission for permission to supply electricity in Dalmatia and other towns in the lower part of Northumberland County.

CRANBERRY, PA.—The Cranberry Creek Coal Company plans to install and operate a street lighting system here and at Harwood.

EAGLESMERE, PA.—The Muncy Valley Light Company, recently organized, plans to erect a transmission system.

GALETON, PA.—The North Penn Power Company, Blossburg, which has acquired the local electric plant, contemplates connecting up with the towns of Gains, Watrous, Sabinsville and Westfield and other Cowanesque Valley towns.

GREEN RIDGE, PA.—The Pennsylvania Power & Light Company, Allentown, plans to build a local substation, with transmission system for service in the neighboring coal fields, to cost about $200,000.

MACUNGIE, PA.—Plans are under consideration for extensions and improvements to the street-lighting system.

NORRISTOWN, PA.—Plans have been approved for the installation of an ornamental street-lighting system on Main Street, from Arch Street to Markley Street.

PHILADELPHIA, PA.—Arrangements are being made by the Brandle & Smith Company, Eighth and Dauphin Streets, for the construction of a power house at Fifth and Bristol Streets, in connection with its new confectionery plant. The cost of the works is estimaated at $625,000.

POTTSVILLE, PA.—The East Penn Electric Company has issued $467,500 in bonds, the proceeds to be used in connection with the acquisition of the properties of the Pine Grove Electric Light, Heat & Power Company and the Lykens Valley Light & Power Company, which will be consolidated. Extensions and improvements will be made.

TARENTUM, PA.—Plans for the proposed local glass works to be built by a new company now being organized by S. F. Lucas and H. E. Rutherford, to cost about $1,000,000, include a power plant.

OAKLAND, MD.—Plans for the proposed local plant of the United States Auto Chain & Twin Hook Company, Grafton, W. Va., include a power house, to cost about $80,000.

BEDFORD, VA.—Plans for the proposed local plant of the Bedford Tire & Rubber Company, recently organized, include a power house.

WASHINGTON, D. C.—Bids will be received by the Quartermaster, United States Marine Corps, until Dec. 28, for 500 porcelain knobs, 200 batteries, 200 telephone brackets, 20,000 insulated staples, 31,000 ft. wire, seven switchboard cords, one test clip, and miscellaneous specialties. (Schedule 255).

North Central States

ADRIAN, MICH.—The installation of an electrically driven pumping plant in connection with extensions to the waterworks and sewer system, to cost $595,000, is under consideration by the City Council.

ESSEXVILLE, MICH.—The Aetna Portland Cement Company plans to install electric power equipment in connection with proposed extensions to cost about $200,000.

FLINT, MICH.—The installation of a new lighting system the entire length of Saginaw Street is under consideration by the City Council.

CLEVELAND, OHIO — The Cleveland Safe Drivers' Club has submitted a proposal to the City Council recommending the installation of ornamental lamps on Superior Avenue from East Ninth Street to East Fifty-fifth Street, the lamps to be similar to those on Euclid Avenue.

SANDUSKY, OHIO—The proposed coal dock to be built by the Pennsylvania railroad company in Sandusky to cost about $300,000, will be equipped with conveying and unloading machinery.

UHRICHSVILLE, OHIO—Plans for the proposed new local sewer-pipe factory to be erected by the Federal Collieries Company, Leader-News Building, Cleveland, include a power plant. The equipment will consist of three 250-hp. boilers, a generator, mechanical stokers, etc.

ELIZABETHTOWN, KY.—Bids will be received by the Mayor and City Council until Dec. 17 for waterworks improvements, including four centrifugal pumps and electric motors B. H. Klyce, Fourth and First National Bank Building, Nashville, Tenn., is the engineer.

LOUISVILLE, KY.—Extensions to the ornamental lighting system are under consideration by the Board of Public Works. It is also proposed to replace the present ornamental lamps with new lamps.

CROWN POINT, IND.—Bids will be received by the Commissioners of Lake County until Dec. 17 for construction of a sanitarium outside of the city limits, consistings of two hospital buildings, children's building, negro patients' building, power plant and garage, to cost about $350,000.

OWENSVILLE, IND.—The Consumers' Power Company it is reported, has acquired the system of the Owensville Light Company and will consolidate with its properties. Transmission-line extensions are planned.

DIXON, ILL.—The Illinois Northern Utilities Company contemplates an issue of $491,000 in bonds, part of the proceeds to be used for extensions and improvements.

APPLETON, WIS.—The Wisconsin Traction, Light, Heat & Power Company contemplates extending its transmission line on Lawrence Street to the western outskirts of the city to meet the increasing demand for service in that section.

BIG FALLS, WIS.—The installation of municipal hydro-electric power plant to cost $150,000, is under consideration. The erection of a transmission line to Clintonville is also contemplated.

EAGLE RIVER, WIS.—Preparations are being made by the Electric Light and Water Commission to extend the transmission lines of the municipal electric system along the Eagle chain of lakes to furnish electricity to the summer resorts in that section.

FOND DU LAC, WIS.—The Eastern Wisconsin Electric Company is considering extending its transmission line from Peebles to Calumetville, a distance of 12 miles, to furnish electricity to farmers and residents in that section. The cost is estimated at about $20,000.

MENOMONIE, WIS.—The Ford Hydro-Electric Power Company has applied to the Railroad Commission for permission to construct a dam and hydro-electric plant on the Menominie River in Florence County, to cost about $1,500,000.

DULUTH, MINN.—The Minnesota Power & Light Company is reported to be preparing plans for the construction of a hydro-electric power plant in the northeastern part of the state, to cost about $20,000,000, with transmission system. The company recently took over the properties of the Duluth-Edison Electric Company, General Light & Power Company, Minnesota Utilities Company and the Great Northern Power Company.

EAGLE GROVE, IOWA—Plans are being considered to establish a municipal electric plant in Eagle Grove.

HARRIS, IOWA—Donald Sterns and John A. Reed, it is reported, have acquired the municipal electric plant. Improvements are planned, including line extensions.

WINTERSET, IOWA—The Council has adopted an ordinance providing for the sale of electricity generated by the municipal electric plant at the city limits for the use of non-residents.

JEFFERSON CITY, MO.—The Missouri Power & Light Company, recently formed to merge ten light and power utilities in this section, it is reported, has tentative plans for the construction of a steam-operated generating plant, to cost about $2,000,000. The company has issued $4,000,000, in bonds, part of the proceeds to be used for expansion.

MOUNTAIN GROVE, MO.—The proposal to issue $40,000 in bonds for a municipal electric light plant was defeated at a special election, held recently.

WAPPAPELLO, MO.—Electric power equipment will be installed by the Taskee Iron & Ore Company at its proposed concentrating plant and washery, to cost about $110,000.

O'NEIL, NEB.—The Minnesota Electric Distributing Company, Minneapolis, has purchased the local electric light plant.

FORT SCOTT, KAN.—Steps are being taken to establish a municipal power plant to cost about $200,000. Roger Toles is engineer.

Southern States

GREENSBORO, N. C.—The Cunningham Brick Company plans to build a power house at its proposed plant near Gordontown, to cost about $85,000.

NORTH WILKESBORO, N. C.—Bids are being asked by the town of North Wilkesboro for two directly connected electric generating units, consisting of two oil engines (150 hp. each) and two 60-cycle, 2,300-volt generators, complete with switchboard, etc., and oil tank.

WILMINGTON, N. C.—Improvements are contemplated by the Tidewater Power Company involving an expenditure of about $600,000. The work will include the installation of a 6,000-kw. turbine.

BADHAM, S. C.—The Dorchester Lumber Company plans to install two generators, motors and other electric equipment at its plant.

DUNCAN, S. C.—Plans are reported to be under consideration by the Southern Power Company, 511 Fifth Avenue, New York City, for the construction of a steam-driven generating plant to supply electricity to the Pacific mill and bleachery at Lyman.

LANDRUM, S. C. — The Appalache Hosiery Mills, Inc., plan to build an electric power plant at their proposed local mills.

PIEDMONT, S. C.—The Southern Public Utilities Company has issued $4,000,000 in bonds, part of the proceeds to be used for extensions, including completion of the 80,000-hp. hydro-electric station at Mountain Island, now in course of erection.

MIAMI, FLA.—The Carl G. Fisher Company will install a light and power system on a tract of beach property now being developed, totaling about 40 miles of wire and cable.

NORTH CHATTANOOGA, TENN.—The Board of Commissioners has awarded a contract to the Tennessee Electric Power Company, Chattanooga, for the installation of street lamps.

BIRMINGHAM, ALA. — The Sudduth Realty Company is planning to install a lighting system on a tract of property near the city now being developed.

CALERA, ALA.—The Alabama Power Company, Birmingham, has acquired the local electric distributing system.

CRICHTON, ALA.—The Gulf Paper Company, Mobile, plans to install electric power equipment in connection with rebuilding its local mill recently damaged by fire with loss of about $200,000.

LITTLE ROCK, ARK.—The installation of 100 additional street lamps throughout the city is under consideration by the City Council. The cost is estimated at about $8,705.

BATON ROUGE, LA.—B. E. Perkins plans to install a street-lighting system on a tract of property now being developed, to be known as College Town.

MELVILLE, LA.—The proposal to increase the expenditure for improvements to the municipal electric light plant and waterworks system from $45,000 to $60,000 was approved by the voters. Bids, it is understood, will be asked for within sixty days. Swanson-McGraw, Inc., United Fruit Building, New Orleans, is engineer.

HEAVENER, OKLA.—The installation of electrically operated pumping machinery at the waterworks plant, to cost about $100,000, is under consideration by the Council. V. V. Long & Company, Colcord Buildingfi Oklahoma City, are engineers.

OKLAHOMA CITY, OKLA.—The Southwestern Light & Power Company contemplates extensions to its steam-operated electric plant and extensions in transmission system to cost about $500,000.

WEWOKA, OKLA.—The proposal to sell the municipal electric plant to the Central Oklahoma Light & Power Company is under consideration. It is proposed to secure electricity from the high-tension lines of the Oklahoma Gas & Electric Company.

GALVESTON, TEX.—Bids will be received by the board of regents, of the University of Texas, care of H. L. Stark, chairman, Orange, until Jan. 14, 1924, for construction of administration building and power plant on the campus in Galveston, to cost about $308,000. The H. M. Greene Company, North Texas Building, Dallas, is architect.

HOUSTON, TEX.—Plans are being prepared for the construction of a new home for the Sisters of Charity of the Incarnate Word, at Wayside Drive and Cut-Off Road, to cost about $500,000. The project will consist of a novitiate building, chapel and power house.

TEAGUE, TEX.—The Community Power & Light Company, Marlin, has acquired the local electric light plant. Electricity for operating the local system will be secured from the Marlin plant. Surveys are now being made for the right-of-way for the proposed transmission line from Marlin to Mexia, via Groesbeck.

Pacific and Mountain States

BELLINGHAM, WASH—The City Council has adopted an ordinance providing for submission at the December election the proposal to construct or purchase an electric light plant, to cost about $500,000. C. M. Adams is city engineer.

TACOMA, WASH.—Ordinances have been passed for three bond issues, $4,000,000, $3,850,000 and $1,425,000 respectively, for the construction of three units, in order noted, for the Lake Cushman power project.

VANCOUVER, WASH.—The Vancouver Shillapo District contemplates draining Vancouver Lake to reclaim 50,108 acres. The project includes diking, ditching and a pumping plant, to cost about $517,488. W. A. Schwarz, Vancouver, is engineer.

ASTORIA, ORE.—The installation of a street-lighting system throughout the burned area of the city is under consideration.

MARSHFIELD, ORE.—The Mountain States Power Company is considering increasing the output of its power plant.

PENDLETON, ORE.—Permission has been granted the Pacific Power & Light Company to erect a 66,000-volt transmission line on city streets.

PORTLAND, ORE.—The Portland Pulp & Paper Company, recently organized, plans to build a power house at its proposed mill, to cost about $1,200,000, with machinery. Roy H. Mills, Broadway Building, is president.

PRINEVILLE, ORE.—The Central Oregon Sugar Company, Portland, contemplates the construction of a power house at its proposed local refinery, to cost about $700,000. The Schwartz Engineering Company, Denver, is in charge.

ARCATA, CAL.—Plans have been approved for the installation of an ornamental lighting system in the business section.

CALEXICO, CAL.—The construction of four hydro-electric plants is under consideration by the board of directors of the Imperal Valley Irrigation District. It is proposed to locate two of the proposed plants on Alamo River and two on New River.

CROWS LANDING, CAL.—The Stanislaus Irrigation District contemplates reorganizing its district, including about 36,000 acres. The plans include diverting water from the San Joaquin River for irrigation by the installation of electrically driven centrifugal pumps. E. N. Bryan, Forum Building, Sacramento, is engineer.

LOS ANGELES, CAL.—The County Supervisors are arranging for an ornamental lighting system on the Washington Boulevard, consisting of 130 standards.

LOS ANGELES, CAL.—Surveys are being made by the Public Service Commission for waterworks on Kings River in Fresno County, in connection with a hydro-electric development for the city of Los Angeles. The project includes the Simpson reservoir, 215 ft. high, 2,670 ft. long on top, 180 ft. on bottom and 20 ft. wide, 43,022 ft. of concrete tunnel, penstock 2,450 ft. long and 81 in. in diameter, and the Kings River power plant, to develop 34,023 hp. The cost is estimated at $7,050,000.

MODESTO, CAL.—The Modesto Irrigation District is considering a bond issue of $500,000 to provide funds for the completion of the Don Pedro power distributing system. H. Storrs is chief engineer.

PORTERVILLE, CAL.—Plans are being considered by C. M. Jones and W. W. Slayden to build a dam and power house to develop about 182 hp., at a cost of about $15,000.

RED BLUFF, CAL.—Steps have been taken by the Chamber of Commerce for the installation of an ornamental lighting system in the business section.

REDDING, CAL.—The purchase of the local lighting system, to be owned and operated by the municipality, is under consideration.

REDLANDS, CAL.—The installation of an ornamental lighting system on East State Street from Sixth to Church Streets is under consideration.

REDWOOD CITY, CAL.—The Pacific Gas & Electric Company plans extensions and improvements to its local system.

SACRAMENTO, CAL.—The installation of ornamental lamps on portions of Twelfth and I Streets, to cost about $25,000, is under consideration by the City Council.

SAN FRANCISCO, CAL.—Bids will be received by the Board of Public Works until Dec. 19 for insulators for electric transmission line for the Hetch Hetchy power and water supply, to cost about $200,000. M. M. O'Shaughnessy is city engineer.

SAN FRANCISCO, CAL. — Plans have been prepared by Bliss & Faville, Balboa Building, for an exchange building for the Pacific Telephone & Telegraph Company to be erected on Bush and Larkin Streets, to cost about $300,000.

SAN FRANCISCO, CAL.—Bids will be received by the Bureau of Yards and Docks, Navy Department, Washington, D. C., until Jan. 16, for a fuel-oil storage system at the Mare Island navy yard, including electrically operated pumping machinery, air compressors and auxiliary equipment. (Specification 4717.)

SUISUN, CAL.—A movement has been started by the Community Club for the installation of an improved street-lighting system.

TORRANCE, CAL.—The City Council is considering an issue of $75,000 in bonds for the installation of an ornamental lighting system.

RENO, NEV. — The Truckee General Electric Company is reported to be considering extending its transmission line into the Stillwater and the Island District.

Canada

HALIFAX, N. S. — The Nova Scotia Power Commission contemplates building a second power plant on the East River with an ultimate capacity of 9,000 hp. The commission has signed a contract with the Albany Perforated Wrapping Company, Albany, N. Y., to furnish electrical energy to the amount of 4600 hp. at its proposed pulp mill at Sheet Harbor.

MILDMAY, ONT.—The Mildmay Electric Light Company contemplates extensions and improvements to its system.

MONTREAL, QUE. — The Algonquin Power Company is considering a hydro-electric development on the Rivière du Loup en Haute, near St. Paulin, to cost about $100,000. J. M. Robertson, Ltd., 20 St. Nicholas Street, is engineer.

MONTREAL, QUE. — Arrangements are being made by the Riordan Company, 355 Beaver Hall Square, for the construction of a power house on the Gatineau River, Chelsea Falls. The Montreal Engineering Company, 164 St. James Street, Montreal, is engineer.

Electrical Patents

Announced by U. S. Patent Office

(Issued Nov. 20, 1923)

1,475,121. METHOD AND APPARATUS FOR CONTROLLING SUGAR CENTRIFUGALS; F. H. Jones, Tuinucu, Cuba. App. filed Dec. 28, 1920. Control of driving motor.

1,475,124. AUTOMOBILE SIGNAL; A. S. Levey, Portland, Ore. App. filed March 16, 1921. Rear direction signal.

(Issued Nov. 27, 1923)

1,475,162. ELECTRIC HEATER; C. C. Abbott, Pittsfield, Mass. App. filed March 5, 1921. Heating unit of elongated tubular type for air heater.

1,475,164. SIGNAL TRANSMITTING SYSTEM; W. R. G. Baker, Schenectady, N. Y. App. filed June 9, 1922. Control of generation and transmission of high-frequency currents for telegraphic signaling.

1,475,174. ELECTRIC MEASURING INSTRUMENT; H. L. Decker, Toledo, Ohio. App. filed Feb. 25, 1920. Ammeter for automobile control board.

1,475,177. COVERING PLATE OF INSULATING MATERIAL FOR TRANSFORMERS AND OTHER HIGH-TENSION APPARATUS; K. Fischer, Cologne-Braunsfeld, Germany. App. filed Dec. 10, 1914.

1,475,184. IGNITION SYSTEM; W. W. Hawkins, Brooklyn, N. Y. App. filed Feb. 20, 1922.

1,475,185. AUTOMATIC MOTOR STARTER; B. W. Jones, Schenectady, N. Y. App. filed March 17, 1921. Compensator for alternating-current motors.

1,475,190. SOUND-DETECTING DEVICE; I. Langmuir, Schenectady, N. Y. App. filed June 6, 1919. Microphone for use under water.

1,475,198. ELECTROPLATING APPARATUS; L. Potthoff (deceased). App. filed Feb. 20, 1920. Plating articles passing through apparatus in succession.

1,475,201. TELEPHONE-EXCHANGE SYSTEM; J. F. Toomey, New York, N. Y. App. filed Dec. 18, 1920. Toll connections established by machine-switching equipment.

1,475,216. TELEPHONE SYSTEM; G. A. Yanochowski, Chicago, Ill. App. filed Aug. 5, 1918. Party-line systems.

1,475,219. RADIO SIGNALING SYSTEM; R. Bown, East Orange, N. J. App. filed Nov. 1, 1920. Operation of several transmission channels under one control.

1,475,232. APPARATUS FOR MEASURING INTERVALS OF TIME; C. W. Ingels, Washington, D. C. App. filed Jan. 30, 1922. Timing operation of relays and switches.

1,475,240. LOW-FREQUENCY MEASURING DEVICE; H. S. Osborne, New York, N. Y. App. filed April 11, 1919. Apparatus for determining impedance of low-frequency circuits.

1,475,251. GENERATOR REGULATION; R. H. Sullivan, Rochester, N. Y. App. filed Dec. 15, 1922. Third-brush type.

1,475,295. ELECTRIC SYSTEM; B. E. Getchell, Plainville, Conn. App. filed July 22, 1922. Automatic control of farm-lighting units.

1,475,297. WIRELESS SELECTION SYSTEM; R. B. Goldschmidt, Paris, France. App. filed June 25, 1920. Mechanical selection of signals.

1,475,334. PERCOLATOR; M. L. Warner, Meriden, Conn. App. filed Dec. 13, 1921. Construction of electric heating chamber.

1,475,338. CONDUIT FASTENER FOR OUTLET BOXES; E. M. Blake, San Francisco, Cal. App. filed Feb. 23, 1921. Adapted to armored cables.

1,475,356. MANIFOLD HEATER; A. E. Tausche, La Crosse, Wis. App. filed May 18, 1922.

1,475,389. HYDRAULIC TURBINES; R. S. Hyatt, Valentine, Neb. App. filed May 9, 1923. Preventing ice formation on metal parts.

1,475,394. MAGNETIC ORE SEPARATOR; F. A. Jordan, Duluth, Minn. App. filed March 22, 1922. Drum type.

1,475,434. SECONDARY OR STORAGE BATTERY; W. E. Kershaw and C. D. Galloway, Philadelphia, Pa. App. filed Dec. 29, 1920. Electrolyte with covering layer of comminuted gilsonite.

1,475,444. TOOL FOR MANUAL DIRECTION; H. B. Mayberry, Gladstone, N. J. App. filed Dec. 6, 1922. Hair clipper operated by electric motor.

1,475,448. ELECTRICAL TRANSMISSION OF COMMUNICATIONS; H. Rowntree, Pass Christian, Miss. App. filed May 16, 1921. Applies either to wireless or telegraphy.

1,475,457. MAGNETIC SEPARATOR; W. G. Swart, Babbitt, Minn. App. filed Aug. 18, 1922. Means for taking out fine magnetic material.

1,475,481. ELECTRODE HOLDER; W. H. Flood, Tooting, and D. T. Smout, West Dulwich, London, England. App. filed May 14, 1921. For arc welding, cutting, etc.

1,475,485. STARTING MECHANISM FOR INTERNAL-COMBUSTION ENGINES; H. H. Gordon, Washington, D. C. App. filed Aug. 11, 1919. Auxiliary engine started by batteries.

1,475,497. AUTOMATIC TELEPHONE EXCHANGE; F. A. Lundquist, Chicago, Ill. App. filed Aug. 16, 1917. Selector switches operated by pneumatic means.

1,475,499 and 1,475,500. LINE SWITCH AND CONNECTION; F. A. Lundquist, Chicago, Ill. App. filed Aug. 3, 1918. Applied to automatic telephone exchanges.

1,475,501. SWITCHING MECHANISM; F. A. Lundquist, Chicago, Ill. App. filed Sept. 9, 1918. For automatic telephone exchanges.

1,475,503. STORAGE BATTERY; S. M. Meyer and W. James, Brooklyn, N. Y. App. filed Oct. 27, 1921. Solid sheet-metal negative electrode.

1,475,506. ELECTRIC POWER PLANT; H. R. Patterson, Toledo, Ohio. App. filed Sept. 10, 1919. Farm-lighting unit with storage battery.

1,475,562. CIRCUIT ARRANGEMENT FOR TELEPHONE PLANTS; G. A. Betulander and N. G. Palmgren, Stockholm, Sweden. App. filed March 31, 1920. Test relays for locating free lines.

1,475,583. VARIABLE-CURRENT GENERATOR; C. A. Hoxie, Schenectady, N. Y. App. filed May 20, 1921. Controlled by photo-electric cell.

1,475,594. SIGNALING SYSTEM; G. A. Pierce, Philadelphia, Pa. App. filed Oct. 31, 1919. Annunciator systems.

1,475,608. COMBINATION GAS AND ELECTRIC STOVE; J. T. Templeton, St. Louis, Mo. App. filed Nov. 1, 1922.

1,475,612 and 1,475,613. MEASURED SERVICE TELEPHONE SYSTEM; J. Wicks, Chicago, Ill. App. filed Dec. 13, 1919. For automatic telephone systems.

1,475,630 and 1,475,631. THERMALLY CONTROLLED CIRCUIT BREAKER; C. Herbst, Chicago, Ill. App. filed Aug. 15, 1921. For electric water heaters.

1,475,632. PROTECTIVE DEVICE FOR RADIO RECEIVING SYSTEMS; H. B. Herty, New Orleans, La. App. filed Feb. 10, 1922. Antenna automatically connected to ground when receiving current is too large.

1,475,645. ELECTRIC WATER HEATER; O. Meyer-Keller, Lucerne, Switzerland. App. filed Feb. 21, 1922. Wedge construction for electrodes.

1,475,667. RHEOSTAT; W. S. Webster, Brighton, Mass. App. filed Nov. 20, 1920. For electric tube filament control.

1,475,715. TYPING SPEED RECORDER; A. E. Oswald, Bogota, N. J. App. filed Jan. 25, 1921. Clock and bell-ringing signal system.

1,475,722. INSULATOR FOR TELEPHONE AND HIGH-TENSION CONDUCTORS; J. Romandy, Harmarville, Pa. App. filed Aug. 25, 1922. Conductor-gripping means.

1,475,537. ELECTRIC REGULATOR SYSTEM; C. A. Boddie, Pittsburgh, Pa. App. filed July 15, 1919. Voltage-regulator system for generators.

1,475,739. MEANS FOR REPLENISHING THE ELECTROLYTE OF ELECTROLYTIC CELLS; P. H. Brace, Pittsburgh, Pa. App. filed Nov. 13, 1919. Maintains electrolyte of constant composition and quantity.

1,475,746. AUTOMATIC LIGHTING SYSTEM; A. M. Candy, Wilkinsburg, Pa. App. filed Nov. 3, 1916. Automatic regulation of engine-driven generator.

1,475,751. ELECTRIC IRON; O. A. Colby, Irwin, Pa. App. filed March 10, 1922. Construction of heating element.

1,475,760. INCLOSED RANGE HEATING UNIT; C. J. Fay, Mansfield, Ohio. App. filed Oct. 20, 1921. Refractory plate-holding element covered by metallic casing.

1,475,766. ELECTRICALLY DRIVEN PLANER AND THE LIKE; S. Gowan, Sale, and L. Miller, Whitefield, England. App. filed Sept. 8, 1920. Dynamic-braking circuit.

1,475,822. ELECTRICAL SYSTEM; R. E. Hellmund, Pittsburgh, Pa. App. filed June 18, 1919. Lighting system for electric railway vehicles.

1,475,823. SYSTEM OF CONTROL; R. E. Hellmund, Swissvale, Pa. App. filed Jan. 5, 1916. Control for induction motors used in locomotives.

1,475,854. MOTOR-CONTROL SYSTEM; H. D. Murdock, Wilkinsburg, Pa. App. filed March 5, 1921. Railway motor control arranged so that motor cannot be reversed when car is moving forward.

1,475,855. TENSION DEVICE FOR ARMATURE BANDING; Wilkinsburg, Pa. App. filed May 24, 1921. Automatic control of tension on wire.